THE CLEAN ENVIRONMENT COMMISSION

Manitoba
Environment

MG 912

PELICAN LAKE ENHANCEMENT PROJECT

REPORT ON HEARING BY
THE MANITOBA CLEAN ENVIRONMENT COMMISSION
MARCH, 1990

JUNE 1990

TABLE OF CONTENTS

BACKGROUND 1

THE PROPOSAL

Frank Penner 5

INPUT FROM PELICAN LAKE USERS

Jessie Low 19
Greg Sholdra 20
Dale Berry 20
Rod Stephenson 20
Michael Taylor 20
John McLelland 21
Doreen Moggey 21
Edward Crawford 22
David Stewart 22
Jack Yellowlees 23
Bill Cole 24
Roy Woolsey 24
Helen Riesberry 24
Gordon Henderson 24
Ron Chalmers 25
Ron McCullough 25

INPUT FROM DOWNSTREAM INTERESTS

Liz Dickson 25
Moir Thompson 25
Ward Snyder 26
Roy McLaren 26
Jake Harms 26
Bob Avery 26
Keith Southam 27
Dora Southam 27
Jim Bell 27
Bob Crayston 31
Norbert Van Deynze 31
Alex McWilliams 31

JURISDICTIONAL/ENVIRONMENTAL CONCERNS

Joe Dolecki 32
Gerald McKinney 32
Eric Geddes 32
Duncan Stewart 33
Gordon Goldsborough 33

LOCAL GOVERNMENT INPUT

Shane Box 34
Howard Nixon 34
Wayne Nichol 34
John Stillwell 34

PROVINCIAL GOVERNMENT INPUT

Fisheries Branch

William Howard 35

Environment Department

Al Beck 38

CORRESPONDENCE FOLLOWING THE HEARING 42

DISCUSSION 47

CONCLUSIONS 52

RECOMMENDATIONS 58

APPENDIX I - List of Exhibits and Presentations 61

PELICAN LAKE ENHANCEMENT PROJECT

BACKGROUND

A proposal was filed on August 15, 1989 under the Manitoba Environment Act by the Water Resources Branch of the Manitoba Department of Natural Resources for the construction of water control works which would allow regulation of Pelican Lake water levels. Severe fluctuations in water levels caused by year to year variations in the regional climate adversely affect recreational use of the lake at very low levels and cause property damage at very high levels. On the premise that sufficient water can be borrowed from the Pembina River, the proposed works have been designed to reduce the magnitude of both high and low water levels historically experienced in Pelican Lake, and to maintain water levels as close as possible to a target level based on long term mean lake water levels.

Pelican Lake is a shallow, elongated basin located in the Pembina Valley (see Figure 1A). Cutting deep into the prairie of southwestern Manitoba, the Pembina Valley was formed by eastward flowing glacial meltwaters at the end of the last ice age and the resulting trench dwarfs the present day streams which now flow through it. The Souris River now flows down part of this ancient channel but exits the valley some twenty kilometres "upstream" of Pelican Lake draining northward into the Assiniboine River. Pelican Lake and three small lakes above it (Bone, Overend and Grassy lakes) are dependent on runoff from a local drainage basin of approximately 690 Km^2 for all inflows. Below Pelican Lake, the Pembina River enters the valley and is joined by the outlet from Pelican Lake before flowing into Lorne Lake. (Figure 1B) The Pembina River continues down the valley, broadening at points to form Louise, Rock and Swan Lakes where sediments deposited by inflowing tributaries have formed natural dams. The Pembina River continues down the valley, across southern Manitoba, and into the United States near Windygates. From there the

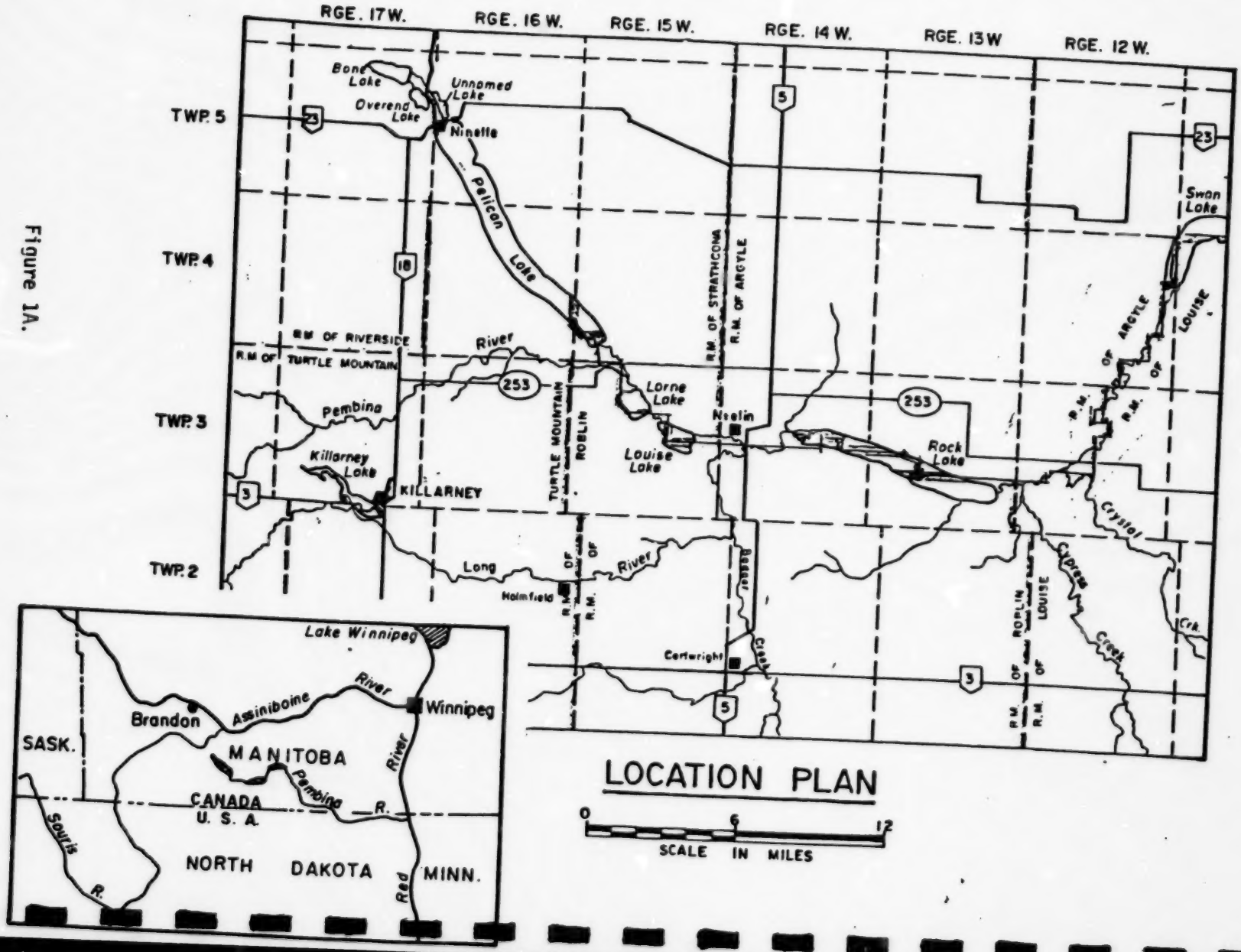

RGE. 17 W.
RGE. 16 W.
RGE. 15 W.
RGE. 14 W.
RGE. 13 W
RGE. 12 W.
TWP. 5
TWP. 4
TWP. 3
TWP. 2
Bone Lake
Unnamed Lake
Overend Lake
Ninette
Pelican Lake
Swan Lake
R.M. OF RIVERSIDE
R.M. OF TURTLE MOUNTAIN
River
Pembina
Killarney Lake
KILLARNEY
TURTLE MOUNTAIN
ROBLIN
Lorne Lake
Louise Lake
Notlin
R.M. OF STRATHCONA
R.M. OF ARGYLE
Rock Lake
R.M. OF ARGYLE
R.M. OF LOUISE
Crystal
Cypress
Crk.
Creek
Long
Holmfield
R.M. OF
R.M.
Basset
Creek
Carberry
R.M. OF ROBLIN
R.M. OF LOUISE
Lake Winnipeg
Assiniboine River
Brandon
Winnipeg
SASK.
MANITOBA
Pembina R.
River
CANADA
U. S. A.
Souris R.
NORTH DAKOTA
Red
MINN.
LOCATION PLAN
0
6
12
SCALE IN MILES

Figure 1A.

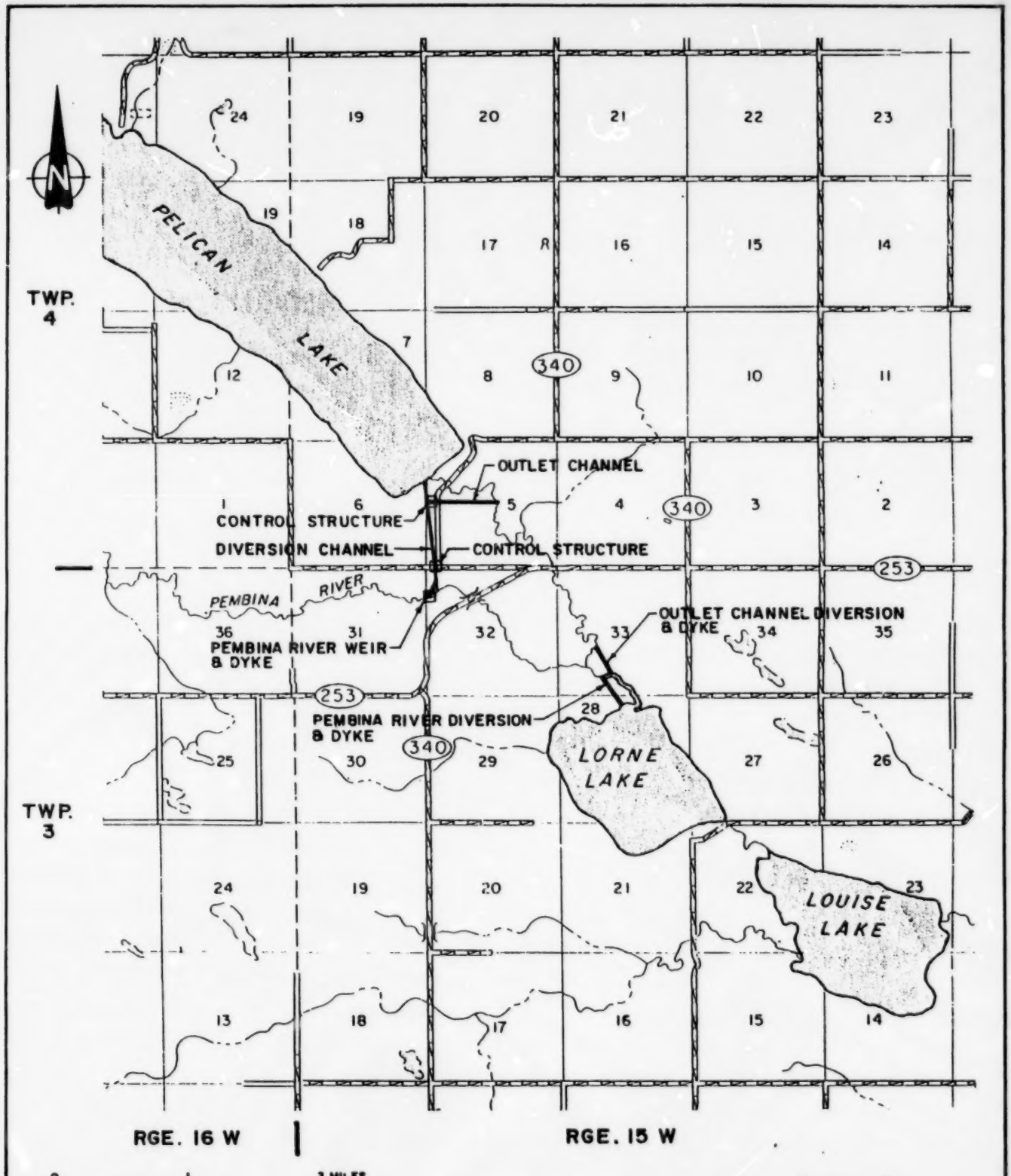


Figure 1B.

DRAWN C.E.W.	Manitoba Natural Resources Water Resources	LOCATION PLAN OF PELICAN LAKE ENHANCEMENT PROJECT	
CHECKED		U.T.M. CO-OR. ZONE 14	5455200 N TO 5457800 N 465700 E TO 468100 E
PREPARED J.A.	SUBMITTED	APPROVED John W. Arthur	SCALE AS SHOWN / DATE 89 07 20 / SHEET 01 / FILE NO. 14-9-1047

river flows beyond the end of the ancient valley, across the flat Red River valley and finally joins the Red River.

Pelican Lake itself is relatively shallow, with a mean depth of 3.96 metres and a maximum depth of 5.33 metres (at a surface elevation of 411.48 metres a.s.l.) The lake is about 20 Km long, oriented on a NW/SE axis, and has a surface area of 26.3 Km^2. Recreational activities centered on the lake include cottaging, swimming, boating and angling. Otherwise, land use in the area is agricultural on lands adjacent to the valley with hay, pasture, and some cereal crops in drier parts of the valley bottom. Activities along the valley downstream of Pelican Lake are similar.

Control works to regulate the level of Pelican Lake and improve both the high and low water level conditions historically experienced were constructed shortly after the first World War but these were damaged by severe flooding shortly thereafter, have since further deteriorated, and are now largely inoperative.

Numberous responses were registered with the Environment Department after a summary of the proposal submitted by the Water Resources Branch was advertised under the Environment Act. Accordingly, the Honourable J. Glen Cummings, Minister of the Environment, in a letter dated December 13, 1989, requested that the Clean Environment Commission hold a public hearing on the Licence application and provide him with a report and recommendations.

A public hearing was convened on Thursday, March 8, 1990 at 10:30 a.m. at the Centennial Hall in Ninette, Manitoba and reconvened that evening at the Royal Oak Inn, Brandon, Manitoba. Commissioners in attendance at the hearing were: Mr. Stan Eagleton, Chairperson; Mr. Ed Gramiak; Ms. Joan Vestby; and Dr. Barrie Webster.

THE PROPOSAL

Mr. Frank Penner, P. Eng., Head of the Special Services Section, Water Resources Branch, Manitoba Department of Natural Resources provided a description of the proposal. He said that both high water levels and low water levels have been problems at Pelican Lake over the years. The Water Resources Branch has accumulated a thick file of complaints about both high and low water levels. The proposed regulation would compress the range of water level fluctuation from 2 metres to about 1.3 metres. High water levels would be reduced through the operation of an improved outlet channel from Pelican Lake utilizing a gated control structure. Anticipated low water levels would be raised by diverting a portion of the available spring flows from the Pembina River into Pelican Lake. The mean target level for the lake would remain similar to the long term mean lake level.

The proposed project is essentially a refurbishment and improvement of the badly deteriorated system of previously constructed control works. In 1919 a control dam on the Pembina River and diversion channel into the lake were constructed in response to a drought period that began in 1912. Shortly after construction, the dam was damaged by floodwaters in the Pembina River and was subsequently abandoned. The diversion channel has also deteriorated through siltation and lack of maintenance over the years.

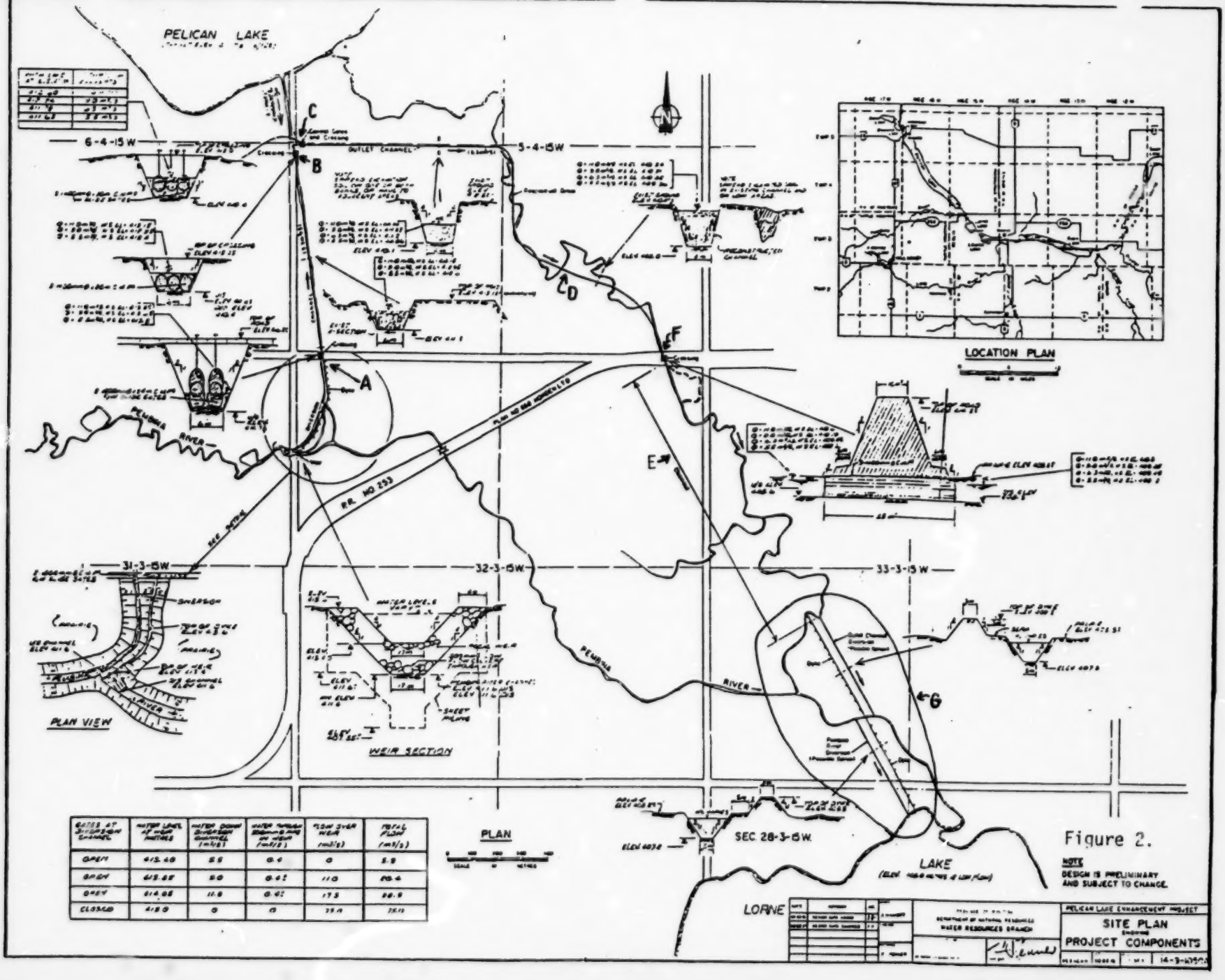
The Pelican Lake Level Advisory Committee completed a study of lake regulation schemes in 1972 and in their report recommended that lake levels be regulated to the extent possible in the range of 411.78 to 411.94 metres above sea level (a.s.l.) during the recreation season utilizing the existing Pembina River diversion and constructing a new stop-log control structure on the natural outlet of the lake. No action was taken on the Advisory Committee's recommendations.

In 1980 the Water Resources Branch conducted a review of the 1972 report and proposed that lake levels would best be controlled by providing both inlet and outlet works to moderate both high and low levels. A 1981 addendum to the 1980 review proposed the combining of the inlet and outlet works near the lake to minimize disruption of existing recreational development adjacent to the natural outlet and to reduce maintenance and construction costs of the proposed regulatory works.

The Pelican Lake Enhancement Project now proposed (see Figures 1B and 2) would provide the capability to regulate levels on Pelican Lake to a target level in the range of 411.48 to 411.94 metres. Mr. Penner said that upgrading and reconstruction of inlet and outlet components would be required, and that the works would be operated to meet several needs. The primary effects from the project will be on Pelican Lake with lesser effects on Lorne and Louise lakes, and with some minor effects on Rock Lake.

The proposed inlet works include the construction of a fixed crest weir in the Pembina River to raise river water levels during periods of low flow and allow water to flow down the existing diversion channel to Pelican Lake. A 500 mm diameter pipe in the weir will allow 0.4 m^3/s of base flow to continue down the Pembina River at all times when this flow in the river exists.

The weir is to be a 1.8 metre high dam across the river with steel sheet piling and rock infill on either side. Mr. Penner said that this type of structure has been used extensively in Manitoba with great success. It is not subject to blocking by debris, is not highly sensitive to soil conditions and does not require a firm foundation. The weir is designed to be able to divert Pembina River flow up to a maximum of 9.0 m^3/s. with provision for a minimum 0.4 m^3/s base flow. There will be no perceptible drop in water surface across the weir at high flows which would cause the weir to "drown



GATES AT DIVERSION CHANNEL	WATER LEVEL AT MAIN PUMPING	WATER DEPTH DIVERSION CHANNEL (m/s)	WATER THROUGH DIVERSION CHANNEL (m/s)	FLOW OVER WEIR (m/s)	TOTAL FLOW (m/s)
OPEN	415.40	2.5	0.4	0	2.9
OPEN	415.85	5.0	0.41	11.0	16.4
OPEN	416.05	11.6	0.42	17.3	28.9
CLOSED	416.0	0	0	29.0	29.0

Figure 2.

NOTE
DESIGN IS PRELIMINARY AND SUBJECT TO CHANGE.

PELICAN LAKE ENHANCEMENT PROJECT
SITE PLAN
PROJECT COMPONENTS

out". Mr. Penner was confident that the proposed structure would not be damaged by very high floodwaters.

A culvert control structure with slide gates to regulate diverted inflows will be constructed at A (Figure 2) to replace a similar existing structure. A culvert crossing will be installed at B (Figure 2) to replace an existing bridge over the diversion. Reconstruction of the existing diversion channel will include the construction of dykes to increase channel capacity to 9 m^3/s when the water surface is 0.3 m below the top of the lowest dykes.

Provided there is available flow in the Pembina River, 0.4 m^3/s will pass downstream through the pipe in the weir. With the water level at the crest of the weir (elevation 413.4 m), and with the slide gates, installed in the diversion channel, wide open, 5.5 m^3/s would flow into Pelican Lake. There will be years when 5.5 m^3/s will not be available for diversion. At those times it will be possible to divert all of the flow above 0.4 m^3/s. Water will not be diverted if flows are less than 0.3 m^3/s, as this flow would pass through the pipe in the base of the weir.

When Pembina River flow at the weir is greater than 5.9 m^3/s, a portion of the water would start to flow over the weir and the flow would divide between the diversion and the Pembina River. Mr. Penner pointed out that it is significant, in terms of downstream impacts, that water will continue to pass the weir at both high and low flows. As much as 9.0 m^3/s can be diverted if the flow in the Pembina River is at 20.4 m^3/s or greater. The undiverted flow would continue down the river. If high inflows to Pelican Lake are not considered desirable, inflow can be reduced by partially closing the slide gates at A (Figure 2).

Outlet works include the relocation of the existing Pelican Lake outlet by combining the outlet channel with the diversion inlet for a short distance and constructing a new drainage way along the north road of SW 5-4-15 W to join up with the natural stream channel. Mr. Penner stated

that advantages of relocating the outlet were that it would minimize disruption to existing developments, reduce the number of bridges and culverts, and reduce channel maintenance requirements. Five acres (2 ha) of land will have to be purchased for the combined channel. The existing Pelican Lake outlet has not been in a natural condition for many years and presently consists basically of two culverts placed high enough to maintain lake water levels. A separated inlet and outlet, such as now exists, provides little circulation of lake water, so that benefits from circulation will not be lost through the construction of a combined channel.

Slide gates will be installed in a culvert control structure at C (Figure 2) to regulate outflow from Pelican Lake where the outlet channel exits from the combined channel. The rate of outflow will depend on the water level in Pelican Lake. When the gates are open outflow could range from 5.5 m^3/s, at a water level of 411.63 m, to 11.0 m^3/s at 412.60 m. Some localized flooding could occur when the outflow is 11.0 m^3/s, although flows could be reduced by partially closing the gates to prevent such flooding.

It is proposed to re-align the stream channel at D (Figure 2) above the crossing of Provincial Road 253. This portion of channel will be straightened to minimize disruption of existing developments and to reduce land requirements. Between PR 253 and Lorne Lake, the outflow will follow the existing channel at E (Figure 2), which will be "cleaned out" to facilitate flow. Existing culverts at the PR 253 crossing at F (Figure 2) will be replaced.

Mr. Penner also said that an option that is being considered is the construction of diversion channels at G (Figure 2) and dykes to separate the outlet channel from the Pembina River above Lorne Lake. This would be done because the Pembina River carries considerable sediment which is deposited in the river at a location just before the river joins the outlet channel. Sediment deposits block the channels. Flow from Pelican Lake spills out

across the relatively flat valley bottom when reaching the junction. The optional channels and dykes would be constructed to ensure the outlet channel remains clear and would allow Pelican Lake releases to discharge directly to Lorne Lake. Flows released from Pelican Lake would then be essentially sediment free and the channel from Pelican Lake would remain unblocked.

Mr. Penner evaluated the proposal utilizing the operating scenario calculated from the design data and actual recorded water flows. The period chosen was from 1962 to 1988, since these are the years for which information is available. Water levels for Pelican Lake were calculated as they would have been if the project had been in place. The operating regime, used in this modelling exercise, was that the structure controls would have been operated daily from April to October. Every morning water levels would be checked. If Pelican Lake was below the target level, available water, up to 5.5 m^3/s, would be diverted into the lake. If Pelican Lake was above target level, 5.5 m^3/s would be released. This set of rules was rigorously applied in completing the calculations. Graphs of the results obtained was prepared showing the difference between the regulated model and actual recorded average monthly levels (see Figures 3A, 3B, 3C). Mr. Penner said that there were daily peaks slightly higher than the listed monthly averages.

In general, the water levels with regulation are predicted to be within 0.3 m of the 411.78 m target, with the exception that Pelican Lake levels will drop below this target as a result of extended drought conditions (although the drop would be less than that occurring without the project).

Lorne and Louise lake levels stabilize at 408 m a.s.l. over a dry year. Mr. Penner suspected that the levels of the lakes are augmented by water from springs. The lower elevation of these lakes may result in sub-soil seepage from Pelican Lake. Water released from Pelican Lake could be used to maintain water levels in Lorne and Louise lakes, if desirable.

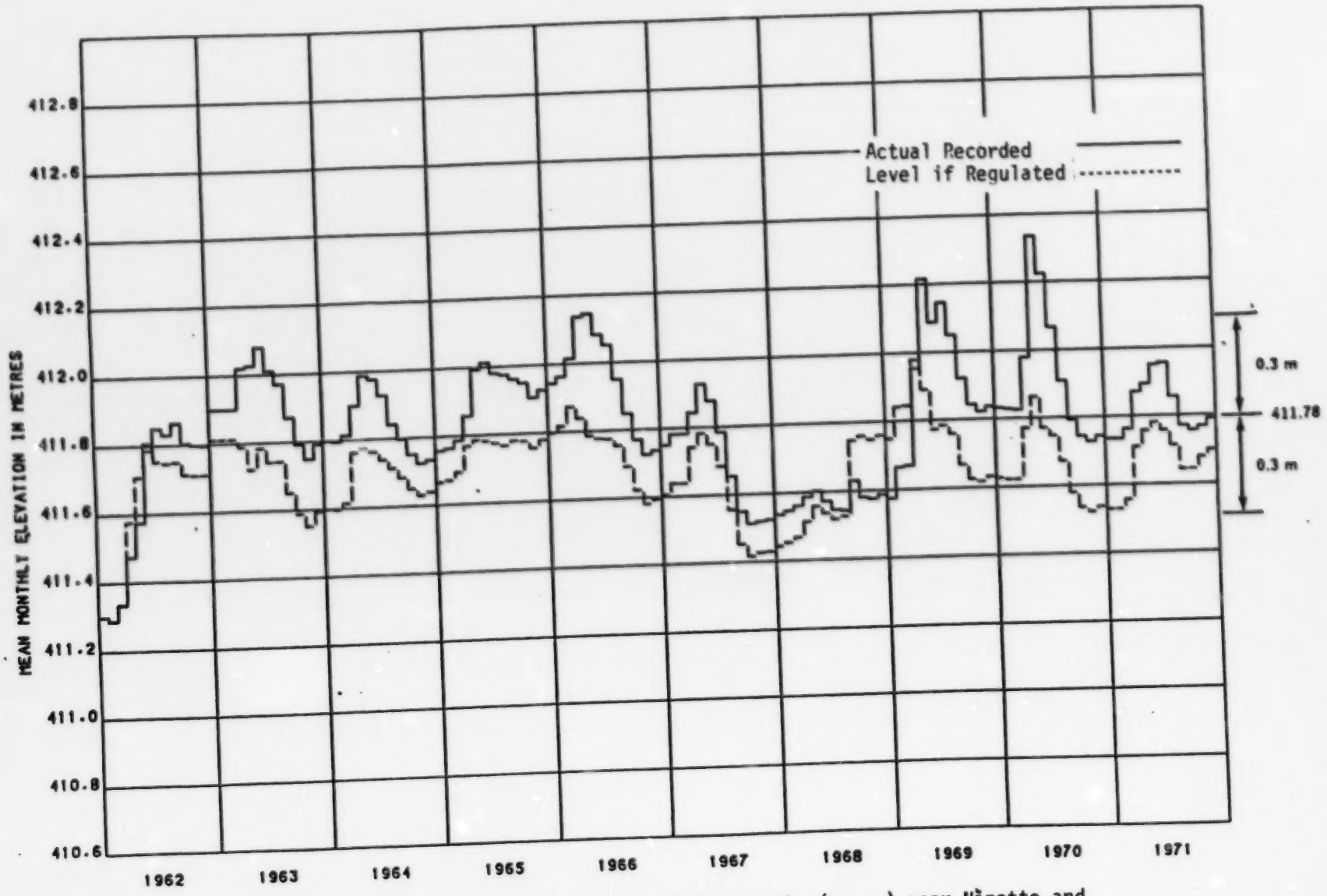


Figure 3A. Actual recorded levels of Pelican Lake (——) near Ninette and calculated level if regulation as proposed had been in place (-----).

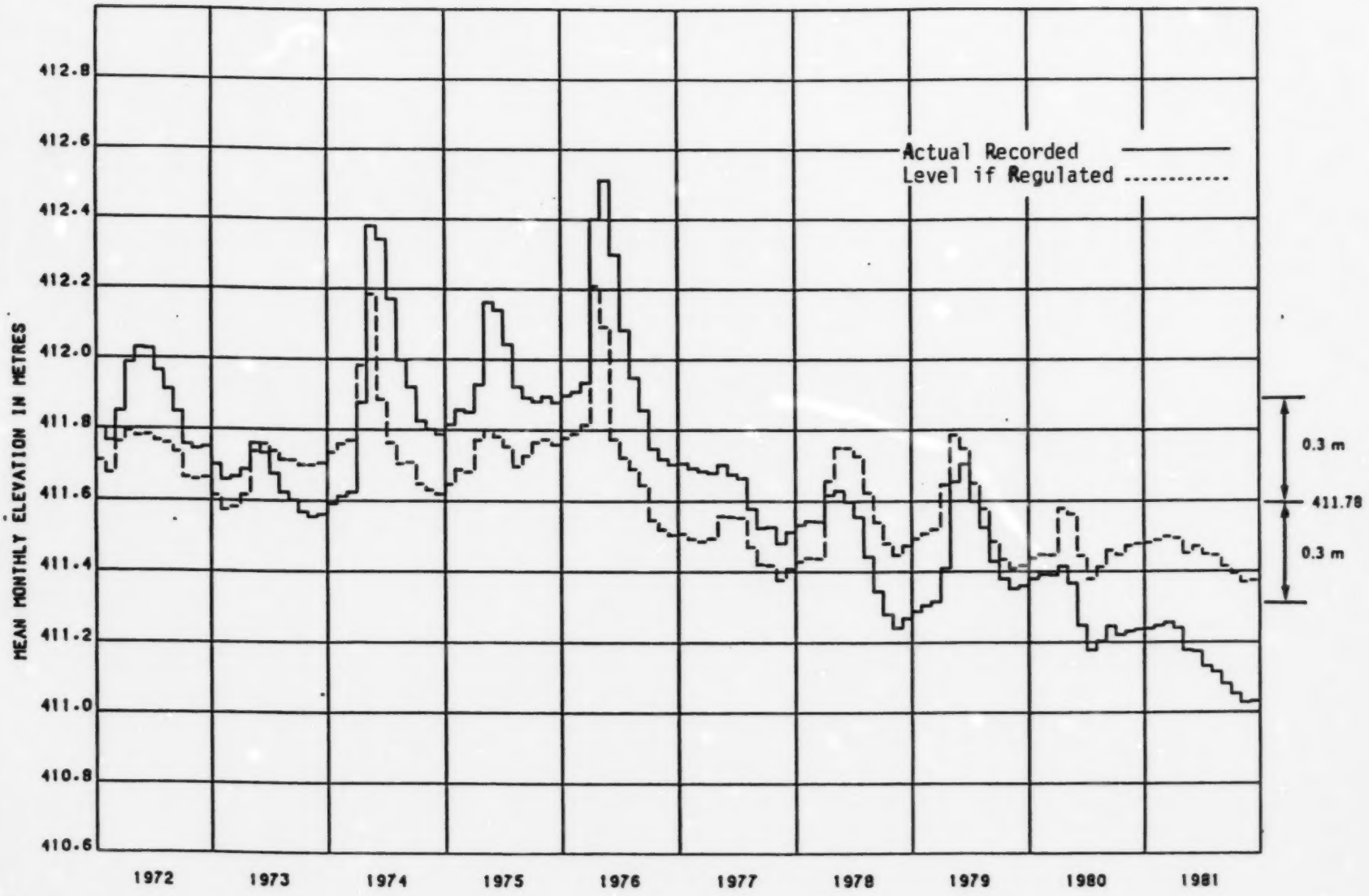


Figure 3B. Actual recorded levels of Pelican Lake (——) near Ninette and calculated level if regulation as proposed had been in place (-----).

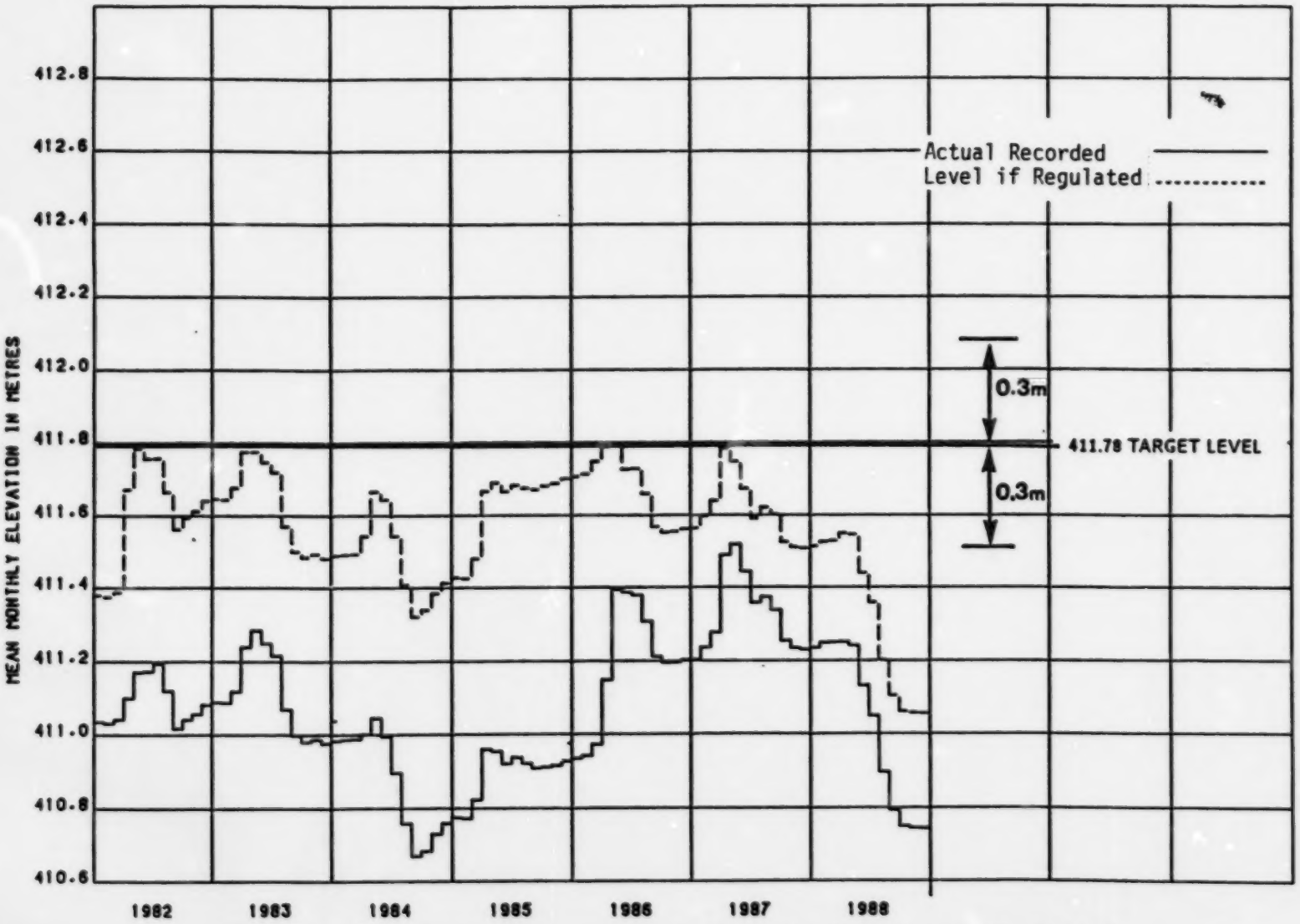


Figure 3C. Actual recorded levels of Pelican Lake (——) near Ninette and calculated level if regulation as proposed had been in place (-----).

Proposal (cont.)

Rock Lake has maintained or exceeded the target level throughout the period of record. The Water Resources Branch maintains a stop-log dam below the outlet of Rock Lake. Upstream from this dam a sandbar has developed that sometimes raises lake levels above the target established by Water Resources. Even in dry years Rock Lake levels have been above the target level, although overflow may not have occurred in 1988. Mr. Penner said that Rock Lake is smaller than Pelican Lake but has a larger drainage area which results in a different set of dynamics. Any reduction in flow to Rock Lake would reduce the flow downstream of the lake but not the level of the lake itself.

Approximately 25% of the measured inflow into Rock Lake comes from the Pembina River above Lorne Lake. The balance of the flow is derived from the Badger Creek watershed which includes an important drainage segment from the Long River. Badger Creek has its headwater in North Dakota. Mr. Penner's conclusion was that only 15 to 20% of the total inflow into Rock Lake would be affected by the Pelican Lake Enhancement Project.

During low flow periods, releases from Pelican Lake could augment Pembina River flows when desired for wildlife or agriculture. A reduction in water level of 0.1 m in Pelican Lake, released over a three month period, would provide a flow down the outlet channel of 0.3 m^3/s. In the fall, the average flow of the Pembina River at the outlet can be 0.1 m^3/s; therefore, the potential flow enhancement benefits would be significant. The flow below Rock Lake averages only about 0.3 m^3/s in September.

Downstream flood control could also be provided by the project. As a rule, maximum flows usually occur during April, following the spring snowmelt. Up to 9 m^3/s of floodwaters could be diverted into Pelican Lake to minimize peak flood levels downstream. Diverted water could be temporarily stored in Pelican lake for two to three weeks and released after floodwaters recede.

Proposal (cont.)

Water quality in Pelican Lake varies somewhat during the year. Limited water quality data supports the suggestion that the hardness decreases as the lake level increases. Another constituent, phosphorus, which contributes to algae growth, also varies throughout the year with the highest levels occurring during the summer. The limited data base shows that higher phosphorus levels seem to occur when water levels are high. Mr. Penner stated that, although the data available are limited, both hardness and phosphorus levels in the Pembina River are slightly higher than in Pelican Lake.

Chlorophyll A, a parameter used to estimate algae levels, is highest in September. This parameter is weakly related to water levels, with chlorophyll A tending to be lower when water levels are highest. Bacteria do not appear to be a problem in Pelican Lake, and Mr. Penner said that the project would not affect this parameter.

In general, Pembina River water quality will not be adversely impacted by any releases from Pelican Lake following construction of the proposed project.

Water released from Pelican Lake will be of equal quality to that in Lorne and Louise lakes. Mr. Penner said that some algae from Pelican Lake might conceivably be carried downstream. Algae that reaches these lakes could decompose and possibly deplete winter oxygen supplies. Mr. Penner said that because these lakes winter-kill in any case, this would not create a problem.

The impact on the fishery in Pelican Lake resulting from the project was expected by Mr. Penner to be small and positive. Any reductions in summer algae production that may result from higher water levels would mean a modest improvement in the winter oxygen supply. The small increase in lake volume will increase the oxygen storage capacity slightly. These two factors should reduce the winter fish kill. Further benefits could be obtained in times of zero flow in the Pembina River if water is released from Pelican Lake to allow

spawning Northern pike to return from Lorne and Louise lakes to Rock Lake. The greatest benefit would be that spawning habitat in marshes at the north end of Pelican Lake, presently dry because of low water levels, would be re-flooded.

Upstream of Ninette there is a Wildlife Management Area established by the Department of Natural Resources. Wildlife habitat in this area should be improved by the maintenance of water levels in Pelican Lake.

An archeological field survey identified one site close to the project, but this site would not be disturbed by the proposed works.

Effects on rare or endangered species were scrutinized in greater detail than effects on general populations of wildlife and vegetation. No effects are anticipated on endangered animal or bird species. It was considered to be possible that there could be some effects on rare plant species in the Lorne and Louise lakes area as a result of low water levels, but Mr. Penner said that low water levels already occur in that area and the project should improve downstream levels.

In conclusion, Mr. Penner said that the Water Resources Branch was seeking a licence under the Manitoba Environment Act to

1. Construct works substantially as shown on the plan entitled "Pelican Lake Enhancement Project, Site Plan Showing Project Components" File No. 14-9-1050A, Revision Date 90-02-27;

2. To regulate the level of Pelican Lake to a target level in the range 411.48 to 411.94 metres;

3. To divert up to 9 m^3/s water from the Pembina River into Pelican Lake. No diversion is to be made when the Pembina River flow at PR 253 above Lorne Lake is less than 0.3 m^3s;

Proposal (cont.)

4. To release up to 11 m^3/s water from Pelican Lake to Lorne Lake. No release is to be made when the flow in the Pembina River at PR 253 above Lorne Lake exceeds 20 m^3/s. Pelican Lake releases would be controlled so that the release flow plus the flow in the Pembina River at PR 253 above Lorne Lake does not exceed 20 m^3/s;

5. To divert water into the lake, release water from the lake and to regulate the level of the lake within the specified limits having regard to the resources of Pelican Lake, Lorne Lake, Louise Lake, and Rock Lake and of the areas surrounding the lakes which are affected by the lakes. In order to advise the Water Resources Branch on the optimum operation of the project, a standing Pelican Lake Advisory Committee with representation of municipal officials, local landowners, cottage owners and fish and wildlife specialists, is proposed to be established. The Advisory Committee would meet at least annually.

Mr. Penner said that details concerning the establishment of an Advisory Committee and its terms of reference have not been determined. The Commission's advice was being sought on this matter. There already is an informal Advisory Committee operating to advise on the present proposal but a new Committee providing advice on the project operation should be more formally structured. Membership on the present Committee includes municipal officials, cottage owners, and farmers.

The proposed control structures could be operated to achieve a variety of desired effects, so it is important to have local input to the Committee, representing a variety of local interests. Flow forecasting information would be important in guiding decisions. Mr. Penner suggested that membership on the Committee could be for a set term by appointment of the Minister. Potential appointees might be nominated or suggested to the

Minister by various organizations. Costs of the Committee might be funded by the government. The Committee's operation likely would not involve a lot of expense as the Committee might only need to meet once or twice a year.

In response to a request, Mr. Penner outlined the specific changes to the proposal made from the December 1989 edition of the report to the February 1990 edition. The proposed level of the diversion channel had been raised to reduce the excavation requirment. Partly to accommodate the raised channel, the weir was widened. The new weir configuration reduces the upstream water level. The new design also includes a 500 mm diameter low flow culvert through the Pembina River weir. Culverts in the diversion channel were enlarged to ensure that a maximum flow of 9 m^3/s could be conveyed. There have been some minor changes to other culverts, and the width of the channels in some sections has been adjusted by about one metre. Most of the changes are design refinements, and Mr. Penner said that they do not significantly change the capability or function of the proposed water control works.

When questioned about possible increases in evaporation losses from Pelican Lake, due to increased storage, Mr. Penner said that evaporation from Pelican Lake would be constant with or without the project, since the surface area would not change materially.

Downstream impacts from the project were the subject of a number of questions. Mr. Penner stated that the effects at Rock Lake would be very small. Using 1977 streamflow data to model potential impacts at Rock Lake, it was determined that the peak lake level would be about 2.5 cm (one inch) lower, and that peak outflow from Rock Lake would be reduced by about 1% in that year. Below Rock Lake the effects are even smaller. The Pembina River above PR 253 is only 12% of the total drainage area in the reach of the river to a point below Crystal Creek. The international boundary is approximately 160 river kilometres downstream of Pelican Lake. Mr. Penner said that the proposal would affect only a relatively small drainage area in the upstream

end of the river basin and that at the United States boundary the effects are very small. Usually there are two spring flood peaks at the border, the first from local runoff and the second peak caused by runoff from the upstream lakes. It is the second peak that would be marginally affected. Mr. Penner said that his department was going to undertake some additional analysis of the effects of the proposed project to the river flow downstream to the border. In his view, since the effects are very small, they are difficult to define.

Mr. Penner said that, in his opinion, the effects to farmers downstream of the project would be beneficial. The proposed Advisory Committee would be responsible for determining flow release patterns to and from Pelican Lake. Basically, in wet years water could be stored in Pelican Lake and in dry years river flow could be augmented by water released from the lake. Overall, downstream farmers would get essentially the same amount of water flow but it would be possible to enhance flow at times when this would provide more benefit.

Total construction cost for the project is budgeted at $600,000. Half of this amount will be contributed by the federal government under the Agri-Food agreement. Mr. Penner did not have figures available for annual maintenance and operating costs, but said that these costs would be the responsibility of the provincial government.

INPUT FROM PELICAN LAKE USERS

Ms. Jessie Lowe, a resident of Ninette did not expect that regulated levels would improve water quality, but she was very concerned about lake levels. It was her opinion that lake levels were directly related to aquifer levels and she said that many wells in Ninette were drying up. Ms. Lowe said that seniors had their life's savings invested in retirement homes, but without water the homes would have no value.

Pelican Lake Users (cont.)

Mr. Greg Sholdra, a Pelican Lake cottager, said that water conditions in the lake have deteriorated, and he supported efforts to improve them.

Mr. Dale Berry, Executive Director of the Manhattan Beach Camp, said that his organization along with the District Executive of the Pentecostal Assemblies of Canada support the proposed enhancement project. The camp has been located on Pelican Lake for 50 years and is one of the largest church camps in Manitoba. Programs are provided for all age groups and families, and facilities are rented to other church groups. Concern was expressed that attendance at the camp would be curtailed if the lake continues to dry up. Mr. Berry said that water diverted from the Pembina River would help immensely to protect the beautiful lake from disaster.

Mr. Rod Stephenson, a resident of Strathcona Municipality, said that he was in favour of the enhancement project. Recreation activities centered around the lake provide an economic base for the region. The number of American tourists coming to Ninette has declined since the 1970's. He said there are 976 cottages located around the lake and the owners pay close to $0.75 million in municipal taxes to the three surrounding municipalities. Most of the work done by local contractors in the area is for cottage owners.

Dr. Michael Taylor, a Pelican Lake cottager and resident of Brandon, spoke in favour of the enhancement project on behalf of the Pelican Lake Yacht Club. Adequate water levels are essential for club functions and events have been handicapped by low water levels, including difficulties in launching and recovering boats. Low levels reduce the overall capacity of the lake to contribute to the tourist industry. Dr. Taylor said the decline in tourism over the past few years, coincidental with lowered lake levels, should be cause for alarm. The lake and surrounding area have not been in a natural condition for 100 years, since the advent of agricultural development, and he concluded that it is time efforts are made to repair these past damages.

Pelican Lake Users (cont.)

Mr. John McLelland spoke on behalf of the Board of the Ninette and District Centennial Hall Inc. which is in full support of the Pelican Lake Enhancement Project. It is their opinion that significant and positive effects could be realized by the project. All areas of southwestern Manitoba need to improve water conservation practices as soon as possible. An Advisory Committee with representation from the area could advise on optimum use of the project and ensure ongoing protection of the environment. It is important that the water table be maintained, as well as water for farm and recreational uses. Mr. McLelland also said that it was his personal opinion that the lake was a beautiful asset to the area, but that if it is not maintained and improved, residents could end up losing this benefit and having to move away.

Dr. Doreen Moggey, President of the Ninette - Pelican Lake Development Corporation Inc., said that this organization supports the project and believes that it will enhance the environment. Recent drought years highlight the need to conserve water in natural reservoirs. Past drainage of pot holes and land clearing have reduced the ability of the land to retain winter snow and hence run-off, and we are now suffering the consequences. The Development Corporation estimates at least 50% of Ninette residences, each of which has its own well, are having trouble with very low water or dry wells. If the water table continues to drop, Ninette will have to consider installing a water reservoir and distribution system. Higher water levels in Pelican Lake could reduce groundwater problems.

Pelican Lake is surrounded by fragile shale banks, and at times when water levels remain very high during the summer months, serious bank erosion occurs, causing tree loss and cottage damage. A method of water control is essential. Both very high and very low water levels are damaging to the environment. The control of water levels in an intermediate range would enhance everyone's environment. The storing of spring run-off to help prevent downstream flooding would also be a worthwhile benefit, in the opinion of the Development Corporation.

Dr. Moggey noted that oxygen levels tend to be lowest in the south end of Pelican Lake. Since the Pembina River begins to run before the ice is off the lake, the ability to divert oxygenated river water into the lake might reduce fish kills.

The Corporation believes that, through judicious operation of control structures, the Advisory Committee could achieve optimal benefits. A management plan should not deprive downstream residents of water. Water releases later in the spring could give fish fry in Lorne and Louise lakes an opportunity to reach Rock Lake. Since Pelican Lake is a natural reservoir, its use for water storage will not require the flooding of any additional land, a major drawback often associated with water conservation projects. Water management will enhance the quality of life in the valley, and the boost to the tourism industry will provide much needed economic diversification.

Mr. Edward Crawford spoke in favour of the project on behalf of the Ninette Community Club. Water is a resource that must be carefully protected, and it is the opinion of the Community Club that the enhancement project is one step in achieving that goal. Mr. Crawford observed that algae levels are reduced when lake water flows down a stream, and this flow action will help maintain downstream water quality.

Dr. David Stewart, a retired medical doctor and former university professor, has been a resident of the Ninette area for much of his life. He said that he was opposed to the project for four main reasons.

1) Dr. Stewart said that the 1919 Pembina River diversion did not work. Low water levels began in 1912 and remained throughout the early 1920's. At that time Dr. Stewart recalled grass growing around the periphery on exposed lake bottom 100 metres or more from the present shoreline. The lake level rose dramatically after spring floods in 1927. This same flood

washed out the control structures, and so the diverted Pembina River inflows did not contribute much to this increase in water level.

2) Data for lake levels and Pembina River flows collected from 1962-1988 show that when the flow in the river is great enough to affect the lake level appreciably the lake is already high, and when the lake is low, river flows are also low.

3) The bottom of e valley consists of alluvial soils, which Dr. Stewart said are unstable and not suitable for foundations or for use as construction materials. Structures built on these soils will not withstand major floods and channels will be prone to constant slumping.

4) The environmental assessment is, in Dr. Stewart's opinion, inadequate. Questions and concerns about impacts to downstream water quality and quantity, waterfowl and fisheries need to be further studied.

In conclusion, Dr. Stewart said that in his experience, Pelican Lake undergoes natural long term cycles of high and low water level phases. In his view and experience, a repetition of the diversion experiment will be a waste of money. The lake level will come up with or without the diversion when conditions are right. In the meantime any constructed works will be unstable, prone to flood damage and will require considerable maintenance. The diversion may have serious consequences downstream through reductions in water quantity and quality. Dr. Stewart said the project should be abandoned.

Mr. Jack Yellowlees, a cottage owner, said the proposed enhancement project is essentially the same scheme requested by cottage owners twenty years ago. Extreme fluctuations in water levels are undesirable, and the project would reduce the range of levels. He supports the project.

Mr. Bill Cole spoke on behalf of the Tiger Hills Wildlife Association. Comprised of members from Ninette, Dunrea and surrounding areas, the Association supports the enhancement project.

Roy Woolsey, spoke in favour of the project on behalf of the Ninette and Area Lions Club. There has been too much human intervention around the lake to now let nature take its course. Low water levels and excessive algae in Pelican Lake are affecting Ninette and other surrounding communities. White Pelicans are otherwise not common in the area, and will likely seek out other habitat if water levels are not maintained. In the fall of 1989, many water bodies in the region were dry and Pelican Lake was one of the few staging areas available for migrating waterfowl. Without intervention this valuable habitat for waterfowl, fish and other wildlife could be lost.

Ms. Helen Riesberry, a cottager, spoke about the beauty of Pelican Lake and what the lake has meant to three generations of her family and many friends. Although she has travelled to many parts of Canada, Ms. Riesberry is always glad to come home to Pelican Lake. Present low water levels concern her, and Ms. Riesberry said that Pelican Lake is now an endangered space. If endangered spaces are not protected there will be no habitat for any species, including endangered species. She said there is a need to identify common goals and work towards compromises to achieve better stewardship of the valley and Pelican Lake to protect it for the wildlife and people who depend on it.

Mr. Gordon Henderson, a cottager, said that since the mid-1970's he has watched water levels drop in Pelican Lake and has observed the water quality deteriorate badly due to increases in algae and weeds. It was his opinion that we should cherish and nurture this valuable resource of southwestern Manitoba. Cottagers provide important economic activity in the area, although at present there is not much new construction and many cottages are for sale because of water problems. He pointed out that it will be the

excess flows that are diverted from the Pembina River to enhance the lake. Mr. Henderson recommended that the project be approved as proposed.

Mr. Ron Chalmers, Chairman of the Pleasant Valley Cottage Owner's Association, said that this organization supports the project. Raising and stabilizing the water levels would restore the shoreline, facilitate aquatic recreation, enhance fish and wildlife habitat and would provide water conservation benefits downstream. In the Association's opinion, the cost of the project is minimal in comparison to the potential revenue generated through tourism and recreation if the lake is restored. If unsuitable environmental conditions persist a loss in economic activity will result.

Mr. Ron McCullough, a cottager, said that because the project will benefit all users of the lake without detrimentally affecting downstream users, he was in favour of the project.

INPUT FROM DOWNSTREAM INTERESTS

Ms. Liz Dickson said that her father owns farmland where some of the project works will be constructed. She supported the concept of maintaining an acceptable water level in Pelican Lake, but said that landowner's rights should be respected. Her brother, Mr. Moir Thompson, said that he was concerned that the raised water levels could make some of their land too wet for cultivation or too soft to carry farm equipment. The weir on the Pembina River will hold water on their fields, making seeding either late or not possible at all in very wet years. Because of the fine texture of valley soils, he was concerned about channel erosion. Mr. Thompson noted that algae and fish-kill problems are not controlled by water levels and have occurred in years when water was high or low. He said they were opposed to having the outlet relocated on their father's land.

Mr. Ward Snyder spoke in favour of the project on behalf of the Tri-Lake Development Group, which represents a variety of interests from areas surrounding Pelican, Rock and Swan lakes. This organization has been working since 1976 to have water control structures installed on the Pembina River and the lakes. It is their contention that spring runoff should be retained throughout the valley for release at a later date. The enhancement project at Pelican Lake is a long overdue step in that direction.

Mr. Roy McLaren, also from the Tri-Lake Development Group said that since the 1940's, measured flood peaks on the Pembina River have been higher than they previously were. He attributed the higher floods to land clearing and drainage, and emphasized the need to retain floodwaters to maintain river flows throughout the year. Americans want the water to flow across the border, but not as a spring flood. Water management along the Pembina watershed must be improved, and the Pelican Lake Advisory Committee could assist in this regard.

Mr. Jake Harms from the Rock Lake Improvement Association said that water is a precious natural resource. Our past record of ditching and draining to get rid of water as quickly as possible was a mistake, and we have to start holding water back. Mr. Harms said that whenever significant flows enter Rock Lake from the headwaters of the Pembina River a large quantity of water is also flowing in from Badger Creek. Rock Lake does not need the extra flooding. It would be better to hold water back in Pelican Lake and release it slowly in the summer and fall. Since spring run-off moves through the river system in a week or two, Mr. Harms did not think Lorne and Louise lakes would be greatly affected by the Pelican Lake Enhancement Project.

Mr. Bob Avery, owner/operator of Sundowner Campground at Rock Lake, spoke in favour of the Enhancement Project. He was satisfied there would be no negative impacts on lake levels at Rock Lake, and said that with the deteriorating condition of Pelican Lake it is imperative that the project proceed.

Mr. Keith Southam, a landowner from Pilot Mound, expressed concern about downstream releases from Pelican Lake and said that late season flooding can damage crops and hayland. He was concerned about the quality of water "flushed" from Pelican Lake. The soil of the Pembina Valley is prone to severe erosion by water, and in the 47 years that Mr. Southam has worked with this land he has seen the fragile soils damaged when not protected by firmly established hayland or pastures. These haylands are very productive and are the basis for a major beef industry in the Pembina Valley. Mr. Southam said care and caution should be used to avoid making any costly mistakes.

Mrs. Dora Southam, also from Pilot Mound, quoted the 1972 report prepared by the Pelican Lake Advisory Committee, saying that raising water levels in Pelican Lake will not change water quality either favourably or adversely. She noted that Rock Lake already has occasional problems with algae, and was concerned that algae flushed downstream from Pelican Lake would aggravate these problems.

Mr. Jim Bell made a presentation to the Commission on behalf of the Pembina Valley Protection Association. Comprising 130 landowners along the length of the valley in Canada, the Association seeks to maintain the existing land use in the valley and retain the natural features of the valley. Mr. Bell said that his group did not receive a copy of the February 1990 proposal in time to review it prior to the hearing, and so his comments were based on the December 1989 version. After researching the environmental and economic impacts, the Association came to the conclusion that the project would have disastrous results on downstream fish, wildlife, agriculture and the environment in general.

Historic climatic data indicates that the prairie region in which the project is located is prone to dry conditions in 50% of the years on record. Heavy flows in the small creeks and rivers occur for only four or five days in spring. Typical shallow prairie lakes like Pelican Lake are subject to algal

growth during mid-summer. For the period of record Pembina River flows have been barely sufficient to supply downstream requirements. Mr. Bell said that this project has the potential of causing severe damage to the downstream ecosystem and depriving the agricultural community of their livelihood.

An analysis of Pembina River flows and Pelican Lake levels for the period 1962-1988 (years for which flow data is available) was conducted by the Association, assuming the project had been in place and operating. The following conclusions were reached by the Association:

1. The largest flows in the Pembina River occur in years when the level of Pelican Lake is already near or above the optimum;

2. The maximum rise in the Pelican Lake water level to which the Pembina River could contribute in any of these years was about 1 metre (1969 and 1972) but these were years in which the lake was already high;

3. In 8 of these 27 years there would have been no direct flow from the Pembina River into Lakes Lorne and Louise to revive the marshes and allow fish spawning. In other years there would have been a reduced amount of direct flow but usually some outflow from Pelican Lake as well;

4. During these 27 years the proposed Pembina River diversion would only have made any real improvement in Pelican Lake water levels in 1982, 1983, 1986 and 1987. This raises the question of whether the expense of the project is justified;

5. In flood years Pembina River flows have attained levels up to 38.5 m^3/s (1975), 44.7 m^3/s (1969), 45.3 m^3/s (1979) and 52.1 m^3/s (1974). These figures give rise to considerable

doubt whether the proposed dykes and control structures could withstand such floods;

6. The proposed Pelican Lake Enhancement Project will not be cost-effective and will not fulfill the predictions for benefit to Pelican Lake. It will have serious consequences for the small lakes and the river downstream, and on fish stocks in Rock Lake.

The Pembina Valley Protection Association is opposed to the Pelican Lake Enhancement Project for a number of reasons. Mr. Bell said that the operating plan does not completely address the riparian rights of downstream owners to receive water of undiminished quantity and quality.

Lorne and Louise lakes were said by Mr. Bell to be reasonably clean with cattails and bullrushes consuming nutrients from the water. These three to four feet deep lakes are important nesting and fall staging areas for migrating waterfowl, including species rare to the area such as Western Grebe, Wood ducks, Goldeneyes and Canvasbacks. Farmers use the lakes for watering livestock and irrigating a market garden. Beaver, muskrat and mink live in the lakes. A reduced water supply would destroy this ecosystem.

Large numbers of spawning Northern pike from Rock Lake are reported to move up the river into Lorne and Louise lakes. Mr. Bell said that the results of his organization's evaluation indicated that under low water conditions, which would be created by the project, spawning fish would be trapped and die in most years.

Mr. Bell stated that local residents had reported that during periods in the 1930's, 1960's, and 1980's, water flows out of the east end of Rock Lake ranged from zero to an insignificant flow. This contradicts the statement by Water Resources that water diverted to Pelican Lake will not

affect Rock Lake levels because Rock Lake reaches its target level every year and then spills water downstream. Mr. Bell said Rock Lake is dependent on all sources of upstream water. Diverting water to raise Pelican Lake levels could cause a drop in Rock Lake levels.

Concern was expressed about the quality of water that would be released from Pelican Lake. Mr. Bell said that the Ninette sewage lagoon and a large number of cottages with improper sewage systems are located in the Pelican drainage basin, contributing to the degradation of water quality. He was concerned that the project would flush excess algae downstream.

Between $3 to 4 million worth of feeder calves are raised in or along the Pembina Valley each year. The valley supplies good yields of grain and forage in dry years. It is very important that there be a fairly heavy water flow in the Pembina River in the spring to rejuvenate wild hay and to recharge the water table. Heavy flows in the summer and early fall, that would flood fields, are not desired. Farmers have adapted their operations in the valley to correspond to the natural water regime in the river. Agriculture in the valley has been very successful. There are third generation families still operating the same farms and ranches.

With regards to federal funding for the project from the Agri-Food Agreement, Mr. Bell said that his group was unable to determine the location of the 400 acres of irrigable alfalfa that would benefit from the project and could find no farmers in the immediate area requesting this irrigation. As the project is partially funded by the federal government and the river is an international waterway, it is the understanding of his Association that a federal environmental impact study is required. Mr. Bell said that they consider the study conducted by Water Resources to be inadequate in sufficiently addressing the downstream effects of this project.

Upstream activity expected in the next few years to develop small water retention structures for the purpose of soil and water conservation will lessen heavy downstream spring flows at the weir. Mr. Bell said that the Turtle Mountain Conservation District has already constructed several small dams on the Pembina River headwaters. Funds allocated for the Enhancement Project would provide more benefits to upstream users if more small water retaining structures were constructed in the headwaters of the river system.

In answer to a question, Mr. Bell said that his group's main concern is that sufficient flows are released in the spring to allow fish spawning movements and to provide for agricultural needs.

Mr. Bob Crayston, a landowner from Rock Lake, said that wells in the area are going dry and the soil is dry deep down. In the 1930's water levels in Rock Lake were very low. Presently a sandbar is holding back run-off and keeping lake levels up. Mr. Crayston said that we need to conserve water, and the Pelican Lake project is a good place to start.

Mr. Norbert Van Deynze spoke in favour of the project on behalf of the Lorne Game and Fish Association. Boat launching ramps and campground sites built by the Association on Swan Lake are presently high and dry because of low water levels on that lake. Water in Pelican, Rock and Swan lakes should be retained and controlled.

Mr. Alex McWilliams grew up in the Rock Lake area. He spoke in favour of the Enhancement Project. Southwestern Manitoba is seriously short of water, he said, and the only water to be seen is where dams have retained runoff. Mr. McWilliams has been involved with the Tri-Lakes Improvement Association, and he said their aim has been to improve the water quality in Pelican Lake first because that is where the need is the greatest and where the most people will benefit. It was his observation that water quality is better when levels are higher. Mr. McWilliams pointed out that with Pelican

Lake being as shallow as it is, an extra three feet of water would nearly double the amount of water under the ice.

JURISDICTIONAL/ENVIRONMENTAL CONCERNS

Dr. Joe Dolecki, an Economics Professor from Brandon University, said that he had only received a copy of the December 12, 1989 edition of the environmental assessment, and he objected to the lack of a broader distribution of the February 28, 1990 edition. It was Dr. Dolecki's opinion that the environmental assessment was very skeletal. He found the description of the operating plan and downstream impacts to be inadequate. A benefit/cost analysis should be conducted, he said, but enough information was not provided with the assessment to undertake such an analysis. Federal funding and the international nature of the Pembina River require federal involvement in the environmental review process. He said that the federal review should be completed and a licence issued before construction starts and that it would be innapropriate to have the government of Manitoba licence this project without contacting the Federal Environmental Assessment and Review Office asking for their advice as to how the process should be enjoined. Federal guidelines should be followed instead of avoided.

Dr. Gerald McKinney, a private citizen commented on the December 12, 1989 Environmental Assessment. It was his opinion that this document was inadequate. He recommended that the federal government should conduct a fully comprehensive and scientifically credible study of the entire Pembina River basin. Dr. McKinney said the project should be shelved until all federal and international obligations are satisfied.

Mr. Eric Geddes from Pilot Mound said that the soils in the area are inappropriate for irrigation. It was his opinion that federal funding allocated on the basis of potential irrigation benefits should be withdrawn.

Mr. Duncan Stewart, representing The Sierra Club of Western Canada, said they were opposed to diverting the Pembina River. He believed that any benefit arising from the project will be more than counter-balanced by the harm it will cause. Also, his environmental organization is opposed to river diversions in general. He stated his organization's view that historically, diversions have never done what their proponents promised and inevitably harm the countryside through which the river runs.

Mr. Stewart stated that there are no guarantees this diversion project will help anyone. The Sierra Club believes that it would be wiser to adapt ourselves to the ebbs and flows of natural systems. An intervention to solve one problem in a natural system results in further problems. Mr. Stewart said that the hearing was evidence that society is learning, but Sierra Club members look forward to the day when every development, large or small, undergoes a full scale independent environmental assessment.

Dr. Gordon Goldsborough, a Biology Professor from Brandon University, stated that although the concept of water quality may have varying interpretations, the definition most widely recognized by the public is the amount of algae in water. After reviewing the Environmental Assessment and examining unpublished water chemistry data provided by the Department of Environment, Dr. Goldsborough determined there is not sufficient evidence to conclude that the amount of algae in Pelican Lake will change because of the addition of Pembina River water.

"Dissolved inorganic phosphorus" levels, considered by Dr. Goldsborough to be the parameter most closely related to algae production, were not evaluated in the Environmental Assessment and data for this parameter does not exist. Unpublished departmental data for "total reactive phosphorus" was considered in the assessment, but this parameter includes forms of phoshorus not available to algae or other plants so that the use of this data is misleading. There is insufficient water chemistry data available for

Pelican Lake and the Pembina River to accurately determine annual and seasonal trends in water quality, particularly during the past six to eight years. Based on the limited data available, Dr. Goldsborough found no significant difference between nutrient levels in water from Pelican Lake and the Pembina River, and he said there is no clear indication that levels of dissolved inorganic phosphorus in the lake will increase or decrease if water from the river is added.

He concluded that there are insufficient grounds to support the argument that water quality, measured in terms of algae levels in Pelican Lake, will improve if the project is undertaken.

LOCAL GOVERNMENT INPUT

Mr. Shane Box, representing the Town Committee for the unincorporated village of Ninette, expressed support for the project. Low water levels in the lake and the local water table are of great concern to the community.

Mr. Howard Nixon, a Councillor from the R.M. of Riverside said that flood waters should be retained and released slowly. His municipality supports the proposal.

Mr. Wayne Nichol, Reeve of the R.M. of Turtle Mountain, said that his Council considered the proposal to be a very worthwhile project, and they were in full support of its approval and implementation.

Mr. John Stillwell, Reeve of the R.M. of Whitewater said that the project would benefit all residents of southwestern Manitoba, and the project was therefore supported.

PROVINCIAL GOVERNMENT INPUT

Fisheries Branch

Mr. William Howard, Southwestern Regional Fisheries Manager, of the Department of Natural Resources, said that with some qualifications Fisheries Branch favours the enhancement project.

Describing the existing fishery, Mr. Howard said that Pelican Lake is a shallow, nutrient rich recreation area that suffers periodic fishkills in winter and summer, but it persists as a significant walleye, perch and pike fishery for the region. Angling success is variable and dependent on the size of the fish population, which is a function of the extent of the most recent winter fish kill. Walleye fry are restocked after a major winterkill, and occasionally adult pike and perch are stocked following an exceptionally severe winterkill.

Although an intensive creel census has never been conducted at Pelican Lake, average angler use is estimated to be 20,000 angler days per year. Based on a creel census conducted at a similar lake (Oak Lake) the average value of the Pelican Lake fishery was estimated to be $320,000/year. It was estimated by Mr. Howard that angler use, and thus the value of the fishery, would increase approximately 26% as a result of the project, primarily because of improved access and improved spawning. Higher water levels will improve boat launching conditions, and should lead to increased recreational use and angler days. Reflooding of preferred spawning areas should improve conditions for natural reproduction. At present, pike numbers are down because in recent years there has been no spawning in the marshy areas at the north end of the lake.

Only slight winterkill reduction was expected by Mr. Howard. Although larger water volumes will offer the potential for larger dissolved

oxygen storage, internal respiration in Pelican Lake exceeds oxygen storage. Winterkill is more closely related to under-ice photosynthetic activity than it is to water levels. Ice clarity and snow cover are the major factors that interrupt photosynthetic activity and the production of oxygen under ice by algae. In the spring of 1985, over 80 tonnes of winterkilled fish, mostly walleye, were removed from Pelican Lake. Mr. Howard said they have had some initial success with pump aeration techniques, and he was hopeful that winterkill losses in the lake could be lowered through this approach.

Significant improvements in water quality were not expected by Mr. Howard. Nutrient levels will be diluted initially but probably not to the point where algae and weed growth are significantly reduced. He stated that the restoration of pristine water quality in Pelican Lake is not possible, but any reduction in algae levels would be an aesthetic and biological improvement.

The provision of the proposed 500 mm diameter pipe through the Pembina River weir will ensure that some of the Pembina River flow will continue downstream. This will help attract spawning fish to the area between Badger Creek and the project site, and with the assured flows, Lorne and Louise lakes should not be affected. Lorne and Louise lakes consistently experience winterkill and therefore lack a permanent game fish population. Water levels in the zones between Pelican and Rock lakes used by spawning pike will be elevated and the flow should help juvenile fish emigrate to Rock Lake.

Concern was expressed by Mr. Howard about reconstruction of portions of the outlet channel. There is a four metre drop between Pelican and Lorne lakes, so that the potential for erosion is significant. The straightened channels will cut through valuable spawning habitat and result in increased stream velocities, erosion and sedimentation. He requested that the areas designated for channelization be re-examined. He offered to visit the site with the proponent to review possible options to minimize impacts to fishery habitat. Mr. Penner agreed that this was a reasonable request and indicated

that Water Resources would re-examine the outlet channel and consider the points raised.

A stoplog structure rather than a weir would have provided some fisheries advantages because stoplogs can be removed in low flow conditions to allow fish passage during spawning migrations. Excessive velocities in the proposed 500 mm pipe would not allow fish passage. However, Mr. Howard said that spawning habitat is sparse upstream of the proposed weir, and fish have only been reported occasionally in the upper reaches. Reduced flows past the weir would probably reduce the attraction for fish to migrate upstream and the extra cost associated with the construction and operation of a stoplog device may be difficult to justify. Protection of spawning habitat through reduced channelization of the outlet would be ample mitigation for losses caused by the weir.

Reduced flows to downstream reaches of the Pembina River were anticipated by Mr. Howard until desired Pelican Lake levels are attained. He did not expect this to be a major problem, but said that during this period there may be fewer fish attracted upstream from downstream sources. Swan Lake, which suffers partial to complete winterkill almost every year, relies on upstream movement of fish to maintain stocks.

In answer to questions following this presentation, Mr. Howard said that there has never been much study of the fishery between Pelican Lake and Rock Lake. Rock Lake supports a good pike fishery, and the area between the lakes seems to be an important spawning and nursery habitat. Spawning success is variable from year to year and is dependent on water flows. Low flows later in the spring may trap the fry. Although additional flow would benefit the fishery, significant impacts will be avoided because the project will allow some flow through the 500 mm pipe in the weir. Mr. Howard also said that there are carp in Rock Lake, but these have not yet made their way up to Pelican Lake.

Overall, Mr. Howard said that the project as proposed would improve the fishery in the area. Over time the area would restabilize and adjust to the modified water regime.

Environment Department

Mr. Al Beck, an Environment Officer from the Environment Department described the departmental review of the proposal. The Environment Act Proposal Form and eight pages of supporting documentation were received on August 15, 1989. Copies were then placed in the public registries, circulated for interdepartmental review and advertised in appropriate newspapers. Terms of Reference developed by the Environment Department for an Environmental Impact Assessment were given to the proponent on September 12, 1989. A report entitled "Pelican Lake Enhancement Project Environmental Assessment", prepared by the proponent, was released on December 12, 1989. In response to comments received from the public and a technical advisory committee made up of representatives from key government departments, this assessment was revised and the new version was released by the proponent on February 28, 1990.

Comments received from the general public and non-government organizations included letters in support of the project which cited benefits expected from the project, a letter requesting an opportunity to present a brief in opposition to the project, letters expressing concern about flooding of private agricultural lands and a series of letters from one individual expressing concerns about the project. Letters expressing support for the project were received from the Rural Municipalities of Strathcona, Argyle and Roblin and from the Villages of Pilot Mound and Ninette.

Various provincial government departments submitted comments. There were no concerns expressed by a number of departments. The Historic Resources Branch identified one archaeological site near the present diversion channel

and requested that this site be avoided. The Resource Allocation Working Group of the Department of Natural Resources reviewed the potential impacts on wildlife, waterfowl, fisheries, forestry, etc. and concluded that overall there would be no adverse impacts from the project. The Fisheries Branch requested that a minimum flow of 0.15 m^3/s (5 c.f.s) be maintained between the outlet of Pelican Lake and Badger Creek.

After receiving the submissions from Natural Resources, Mr. Beck requested a further evaluation with regards to rare and endangered species. Dr. Karen Johnson (Curator of Botany, Manitoba Museum of Man and Nature), was contracted by the proponent to examine the potential impacts upon rare and endangered species. She reported few concerns about rare plant species surrounding Pelican Lake. However, because of inadequate information, and the potential for water levels in wetlands downstream of the project to decrease, she recommended a thorough survey of rare plant species in potentially affected areas.

The Wildlife Branch anticipated no effects upon endangered animal species.

Areas considered by Mr. Beck as likely to be affected by the project were Pelican Lake itself and the downstream reaches of the Pembina River including the associated lakes and wetlands. He said that environmental aspects which should be given consideration, if the Commission recommends that a licence be issued, include:

- the impacts of potential flooding along the Pelican Lake shoreline;

- the impacts upon fish, fisheries habitat, and wetlands of the diminished flow of water through the downstream reaches of the Pembina River and associated lakes and wetlands; and,

- the archaeological site reported at NW32-3-15W.

Following his formal presentation, Mr. Beck made a number of general comments. He said that water quality is a term that can mean different things to different people and is dependent on the intended use of the water. The phosphorus level data for Pelican Lake and the Pembina River is available only for total phosphorus. Only a small proportion of total phosphorus is dissolved in water and thus available for uptake by plants. While diversion of Pembina River water into Pelican Lake may mean greater inputs of phosphorus to the lake, the available data is insufficient to determine the impact on algae production. Algae blooms are aesthetically displeasing and when the bloom collapes, decomposition occurs which can result in unpleasant odors and the consumption of the oxygen, leading to stress or the death of fish. Algae production is a symptom of nutrient loading. Obviously, nutrient input from the drainage basin and the lake sediments is sufficient to cause algae blooms from time to time.

The Ninette sewage treatment lagoon is located in a marsh adjacent to the north end of Pelican Lake. The lagoon itself reduces both bacteria and nutrients in the town's wastewater. The surrounding vegetation in the marsh is also effective in the reduction of nutrients, so that effluent passing through the marsh is assumed to be be further purified. A number of cities take advantage of this natural purification process and use cattail marshes to treat their sewage.

Mr. Beck pointed out the difficulty of comparing different lake systems. Each lake is unique and requires an independent assessment.

Mr. Beck explained that Pelican Lake is too shallow to thermally stratify. Because the lake is shallow, mixing by wind action keeps nutrients continuously available for the growth of algae. The physical conditions (i.e.

depth) on Pelican Lake also effectively prevent the establishment and growth of weeds because light does not penetrate to the lake bottom.

Lorne and Louise lakes are different than other lakes in the system. Because they are shallower, light penetrates to the bottom so that rooted weeds can grow. These two lakes already have an abundant supply of nutrients, but the weeds restrict the growth of algae and thus weeds rather than algae flourish. Because the algae cannot compete with the weeds they are not present to the same degree in Lorne and Louise lakes as in Pelican Lake. Any increase in nutrient inputs that might occur as a result of the Pelican Lake Enhancement Project will not change this situation. The difference between the biological regime of Pelican Lake and Lorne and Louise lakes (algae vs weeds) will not be altered by the project.

In response to a question, Mr. Beck said that only a very small percentage of lake nutrients are present in the biomass (weeds and algae). Although actively growing cattails contain a tremendous quantity of nutrients, the amount is insignificant compared to the total nutrients present in Pelican Lake. Removing cattails from Pelican Lake would not have a measurable impact on the total nutrient supply. Similarly any algae carried downstream from Pelican Lake would not introduce a significant nutrient load to Lorne and Louise lakes. Algae will depress the oxygen supply on decomposition. Mr. Beck pointed out that algae blooms could originate anywhere in the system if conditions are right. This would also include species of blue-green algae that are capable of releasing toxins harmful to man and animals.

Mr. Beck explained and qualified use of the term "flushing" as applied to the proposal. "Flushing" implies that water in the entire lake will be drained and replaced with cleaner water. He said this is not going to happen. Some water will be released from Pelican Lake, but the entire lake will not be "flushed".

Most of the changes to water quality in Pelican Lake resulting from the project will probably be undetectable. Mr. Beck said there will be little change in the amount of algae, some benefits for dissolved oxygen levels, and improvements in terms of hardness.

CORRESPONDENCE FOLLOWING THE HEARING

Prior to the termination of the hearing in Brandon, the Commission invited Mr. Jim Bell (at his request) to make a further written submission in order to allow the Pembina Valley Protection Association an opportunity to study and respond to the revised February 28, 1990 proposal report. After discussing the revised report with his board of directors, Mr. Bell provided this submission to the Commission on March 19, 1990. Changes to the weir and inlet channel proposed in the February 1990 environmental assessment report led the Pembina Valley Protection Association to conclude that the weir will overflow on fewer occasions, with the result that even less water will be provided downstream than under the conditions of the original design.

The natural water flow condition on the Pembina River is that of heavy flows in the spring which rejuvenate marshes and hayfields, recharge the water table, and fill sloughs and lakes. Heavy flows also erode and breach beaver dams and thus allow spawning fish to move upstream. The February 1990 proposal would, in the opinion of the Association, prevent these natural phenomena from occurring. Although optimum conditions do not occur on the Pembina River every year, the natural frequency of such events should not be reduced as would happen if the proposal is implemented.

The Association contended that heavier flows than the minimum 0.4 m^3/s proposed to be released through the pipe at the weir base, are needed to facilitate spawning of fish from Rock Lake. At 0.4 m^3/s it would take at least 50 days to fill Lorne and Louise lakes to the point where water starts to overflow downstream of these lakes. Assuming that 11 m^3/s is always

diverted into Pelican Lake before water starts flowing over the weir, the Association calculated that over the 27 year period of streamflow records there would have been flow over the weir in only 12 of those years, and in only 4 years would there be conditions favourable for spawning.

If the project proceeds as proposed, the Association intends to take legal action to obtain at least 50% of the flow to provide for downstream agricultural requirements.

The submission stated that outflow from Rock Lake has been completely blocked with a pressure ridge for the past four years.

The Pembina Valley Protection Association recommended that the project be abandoned because, in their opinion, it would be extremely detrimental to agriculture and the environment.

Mr. Frank Penner was asked by the Clean Environment Commission to respond to the concerns raised in the March 19, 1990 submission from the Pembina Valley Protection Association. In his response dated April 10, 1990, Mr. Penner noted that Pelican and Rock Lake levels and outflows are already controlled and that a state of nature does not exist in the project area.

Changes from the December 1989 to the February 1990 report do not significantly affect the performance capability of the project, other than the addition of the pipe in the weir to maintain a base flow. The elevation and dimensions of the weir and some culverts were altered generally to reduce the volume of excavation and land required and to reduce the drop in water surfaces across the structure. It is not correct to say that the inlet has been enlarged to accommodate 11 m^3/s as is said in the March 19, 1990 Pembina Valley Protection Association submission. The channel capacity has always been 11 m^3/s.

Correspondence (cont.)

Mr. Penner said that the analysis of the project's effects on Pelican Lake levels by the Water Resources Branch is a reasonable and adequate estimate. The analysis presented by Mr. Bell at the hearing was deficient because project effects were not accumulated and carried forward from one year to the next. A proper calculation should use the regulated lake level at the end of the previous year as the starting level for the current year - not the recorded level at the end of the previous year. Mr. Bell's conclusion that the project would only improve Pelican Lake levels in 4 of the 28 years is in error because it is based on a faulty analysis. Mr. Penner also noted that this analysis did not take into account the pipe in the weir which will maintain a base flow.

In his submission, Mr. Penner stated that an evaluation of the available data indicated that outflow from Rock Lake may not have occurred in 1977 and 1988. The evidence led him to conclude that there must have been outflow from Rock Lake in most other years, and Mr. Penner disagreed with the statement that outflow from Rock Lake has been completely blocked for the past four years. Mr. Penner noted that if there were no outflow from Rock Lake under present conditions then the project would have no effect below Rock Lake and therefore there should be no concerns for the reach of the river below Rock Lake.

Any reduction in spring flooding would depend on the magnitude of spring runoff and would vary from one year to the next. Pembina River flows are significantly affected by the project only above Badger Creek. Only the haylands limited to this 10 kilometre stretch of the valley would be affected by reductions in spring flooding.

The operation of the project would provide some flexibility to mitigate effects and possibly to enhance conditions by extending the duration of flows through Lorne and Louise lakes. Releases would be controlled to

prevent flooding. The regional impact on fish, waterfowl, and wildlife may well be positive.

Half of the $600,000 cost of the project is expected to come from the federal government. Mr. Penner noted that Water Resources is aware of the federal approvals required and they have been working for some time with federal agencies to obtain these approvals. All appropriate federal approvals, including assessment, will be acquired before the Province proceeds with the project.

In a letter dated April 30, 1990, Mr. Jim Bell commented on Mr. Penner's response. The validity of the analysis of project effects conducted by Water Resources Branch is dependent on how the computer is programmed, and Mr. Bell suggested that the data be submitted to an independent mathematician for analysis and comment. Projections about how long it would take for Pelican Lake to fill, starting at its present low level, under scenarios of continued dry years, years of normal flow and years of heavy flow would be useful in understanding the potential impacts to Lorne and Louise lakes.

Apart from the Pembina River system, Lorne and Louise lakes receive natural input only from one small ravine system. Residents know of no reliable springs along these lakes. Old-timers remember that in the 1920's and 1930's both lakes had very low water levels. Mr. Bell emphasized that spring flooding is advantageous to these lakes but that inputs in late summer or autumn are deleterious. Flows released only through the 500 mm pipe in the weir will not provide sufficient flow to maintain levels in Lorne and Louise lakes. Mr. Bell asked what steps would be taken to prevent this pipe from being plugged with debris.

Referring to Mr. Penner's statement that only the 10 Km stretch of valley between Pelican Lake and Rock Lake will be affected by the project, Mr. Bell noted that the area contains two lakes and valuable farm land. The residents consider this area important.

Correspondence (cont.)

The reasoning behind the location of the proposed new outlet channel along the north boundary of SW 5-4-15 W was questioned. Mr. Bell wondered why the channel would be located entirely on the farm land side of the boundary. He suggested the loss of land should be shared equally between the productive farmland on one side of the boundary and the cottages and golf course development on the other side.

Mr. Frank Penner responded to these comments in a letter dated May 8, 1990. The 500 mm diameter pipe through the weir will be checked periodically and cleaned out as required by Water Resources Branch staff, with funds provided from general maintenance. Sediments removed from the project will be deposited on government land purchased for the project.

Over the period 1962 to 1988 the flow in the Pembina River has been less than 0.4 m^3/s for an average of 180 days during the period March to October or 74% of the time. Only a small portion of the valley would be subject to reduced spring flooding. Below Badger Creek the valley will function as in past years due to the tributary streams (i.e.; Badger Creek). The majority of releases from Pelican Lake will occur in the spring. Pelican Lake, which discharges water of no worse quality than the Pembina River above Lorne Lake, has naturally discharged into the Pembina River system and the project simply modifies the present pattern of discharge to Lorne Lake. If desirable, the level of downstream flooding determined to be beneficial could be provided by the project.

In terms of determining the location of channels, Mr. Penner said that the most economical acquisition of land required to facilitate the outlet channel was chosen.

DISCUSSION

All of those who made presentations at the hearing agreed that Pelican Lake is a beautiful lake. Regionally it is a highly valued location for recreation, cottaging, fishing, and tourism. There are few lakes of comparable size and quality in south-western Manitoba and many of the presentations made in support of the proposal addressed the need to preserve and maintain the natural beauty of Pelican Lake.

Fluctuating flows and water levels are significant characteristics of the waterbodies affected by the Pelican Lake Enhancement Project, especially Pelican Lake. It is generally the snow melt in the spring that results in the recharge of these lakes. The spring recharge flood abates rapidly, summer flows generally are low, and fall and winter recharge flows are minimal. Below Rock Lake, the flow of the Pembina River has become zero, on occassion. Runoff from rainfall quickly enters streams in the basin and some flooding along the Pembina River can occur in the summer or fall after heavy rain storms.

Fluctuations in streamflow over decades reflect long term variations in annual precipitation amounts in this prairie river basin. Between 1962 and 1988 the average maximum recorded flow rate on the Pembina River at PR 253 above Lorne Lake has been 15.0 m^3/s, but the maximum flow recorded at that site ranges from 52.1 m^3/s in 1974 to 1.6 m^3/s in 1988. From year to year there is extreme variability in flows in the Pembina River. It was reported by local observers at the hearing that water levels in Pembina Valley lakes were low in the 1920's and 1930's. During the early 1970's water levels were high on Pelican Lake. Fluctuations in the amount of annual precipitation received from year to year follow long term climatic conditions.

The Pembina Valley lakes are affected by these seasonal and long term fluctuations in incoming streamflow, but levels are also a function of various dams or other regulating structures. Sediments deposited by tributary streams

formed natural dams that originally created the lakes. Wave action and wind generated currents have a continued influence on these dams.

Beaver dams can have a significant influence on water levels but beaver activity varies according to population levels. Factors influencing beaver numbers are many and include trapping effort.

Water Resources have constructed and continue to maintain a dam on Rock Lake to regulate levels at an established target level. There has been a history of attempts to control levels on Pelican Lake where extreme fluctuations have frustrated recreational users.

Native plant species, including any rare or endangered species, growing in the streams and lakes of the valley, or in the Pembina River floodplain where they are affected by changing flows, are adapted to these variations, and in some instances require fluctuating water levels to survive. Many species need spring flooding followed by autumn drawdown for optimal growth. Other species need the longer term fluctuations of drought and high water years to complete their life cycle. For example, bullrush seeds sprout on exposed mudflats but adult plants grow best in standing water. Vegetation dependent on fluctuating water levels in turn provides habitat for the animals and waterfowl living for all or part of their lives on the streams and lakes. All plant and animal species found in the area that would be affected by the project are to varying degrees dependent on and adapted to fluctuating water levels.

Optimal conditions vary from species to species such that there is no particular regime that is best. Water conditions under which these species have evolved have been variable both annually and from year to year. In this regard, it is important to note that there have always been fluctuations. The general pattern has always been a spring runoff providing the higher flows, with lower flows for the rest of the year. A series of low water years could

cause a shift in plant species distribution and could be disruptive to human uses, but as long as a low water period is eventually followed by higher water levels, the ecosystem will remain healthy. Substantial changes to long term mean lake levels or streamflow, or changing seasonal runoff patterns could cause permanent changes to the downstream ecosystem.

Fluctuations in water levels on Pelican Lake are greater than on the immediate downstream lakes because the watershed providing runoff into Pelican Lake is limited. In general a larger watershed tends to average out runoff characteristics so that fluctuations are less extreme. On Pelican Lake the extreme fluctuations in water levels interfere with recreational uses, and the intent of the Water Resources proposal is to reduce extremes but not eliminate fluctuations. Low water conditions, presently occurring on Pelican Lake, reduce the recreational value of the lake. This does not, however, mean that the ecosystem is unhealthy. Habitat for some species might be reduced by the present low water levels, but other species could benefit. For example, shorebirds can be seen feeding on exposed lake bottom around the shoreline.

The optimization of the benefits of the Pelican Lake Enhancement Project requires the reduction of extreme water levels on Pelican Lake, while providing adequate downstream flows. Higher flows in the spring followed by drawdown to mimic the natural downstream regime is needed if the existing ecosystem is to be protected. Unfortunately, some natural and human uses occurring downstream have unique optimal water regimes that often vary. Determining what should be optimized involves, to a certain extent, placing values on competing downstream uses in order to establish an ideal or "target" regime. Theoretically an optimum downstream regime is an important objective, but actual streamflow and lake level conditions will a) dictate what flows are possible, and b) provide further refinement towards establishing an ideal regime because it will give an indication of what would have happened if the project had not been in place. Flow forecasting will provide important information in this regard.

Discussion (cont.)

Over the past one hundred or so years, there have been considerable changes to the Pembina River and Pelican Lake watersheds through human activity, and it was noted at the hearing that these systems are no longer in a natural condition. Alterations include the 1919 diversion and subsequent modifications to the diversion scheme which continued to provide some Pembina River water into Pelican Lake until the early 1970's. The Pelican Lake outlet has been modified a number of times and the outlet channel has been upgraded and straightened in some places.

Agricultural practices, including land clearing and drainage projects, have likely altered the water quality and runoff characteristics of tributaries to the basin, leading to higher sediment load and faster runoff. Local water projects in the Turtle Mountain Conservation District, and perhaps in other parts of the basin, which have been constructed principally to retain water, will result in some improvment in water quality and reduced flooding in tributaries.

Human activity around Pelican Lake has had an unquantified influence on sediment and nutrient loading to the lake, with a corresponding unquantified deterioration in water quality. The sources of this pollution are mainly non-point sources and the effects are cumulative. Construction activities, road building, land clearing and drainage, and a number of farming practices all contribute to increased sedimentation. Disposal of human and livestock wastes and fertilizer runoff from fields can increase nutrient loading.

Although these non-point sources of pollution were mentioned at the hearing, they will not be affected by the Pelican Lake Enhancement Project and were beyond the scope of the assessment prepared by the proponent. Eliminating or reducing these sources of pollution would provide undetermined improvements in Pelican Lake water quality. The principles outlined in the

Manitoba government's Soil and Water Strategy, recently developed in response to commitments to sustainable development, are relevant to this problem. Action, in accordance with these principles, to the Pelican Lake situation could in the long term lead to improvements in water quality. Improvements in water management and resulting water quality might also result from all appropriate Manitoba rural municipalities joining together to form a Pembina Valley Watershed Conservation District.

There were concerns raised at the hearing that federal funding of this project through the Canada-Manitoba Agri-Food Agreement is inappropriate. It was argued that the project would provide benefits to tourism and recreation but not to agriculture. Mr. Penner stated that benefits to agriculture would include flood protection and enhanced flows during low flow periods. He also said that the project would create a greater potential for irrigation, although this possibility was limited.

Another concern expressed at the hearing was that federal funding of the project, the potential for the project to impact fisheries, and the fact that the Pembina River is an international waterway require environmental review and licensing of the project at the federal government level. In this regard, Mr. Penner has stated that all federal approvals will be obtained before construction of the project begins.

The Clean Environment Commission's consideration of this matter is mandated under the Manitoba Environment Act. While the Commission recognizes the importance and necessity of compliance with federal requirements, questions of federal involvement are beyond the jurisdiction of the Commission.

CONCLUSIONS

After considering the proposal and evidence presented, the Clean Environment Commission concludes that a licence should be issued to the Water Resources Branch of the Manitoba Department of Natural Resources to construct and operate the Pelican Lake Enhancement Project, subject to the terms, limits and conditions recommended in this report.

Pelican Lake is an extremely valuable resource to the people of the region in which it is located. The Commission believes that the levelling of the extremes of the high and low water that have been experienced over the years, by the implementation of the project, will provide significant benefits to the lake users and a number of interests, including Ninette residents, recreational users, the surrounding rural municipalities, the tourist trade and other commercial interests.

There is also some risk of adverse environmental impacts. For this proposal, the potential to cause adverse environmental impacts will change every year in response to water conditions in Pelican Lake and the Pembina River and therefore must be the subject of ongoing decisions over operation of the control structures.

Adverse impacts from the Pelican Lake Enhancement Project are most likely when Pelican Lake is being refilled. The extent of these potential impacts depends on how low Pembina River flows are during the period when refilling takes place. Once Pelican Lake reaches target level the potential for downstream impacts will be less. At all times the extent of downstream impacts will depend on how the control structures are operated. Operation of the control structures could also provide downstream benefits such as flood control and flow enhancement.

The analysis of project effects conducted by Water Resources Branch predicted that operation of the control structure and diversion will provide

improved regulation of Pelican Lake water levels. Downstream impacts were predicted to extend only as far downstream as Rock Lake, and to be greatest between Pelican Lake and Badger Creek. Mr. Penner said that below Rock Lake changes to Pembina River flows would be barely detectable excluding low flow periods when Pelican Lake water is released to augment Pembina River flows.

At the hearing Mr. Penner said that a more detailed hydrologic analysis was being conducted by the Water Resources Branch to more precisely predict downstream impacts on the total reach of the Pembina River between Pelican Lake and the United States border. Mr. Penner said that this new study will be completed soon and indicated that the results of the study confirm the predictions of the first model and analysis that downstream impacts will be minimal.

The Commission recommends that when this hydrologic report is completed, the Environment Department should review its findings and compare them to those of the original study, to determine if there is any significant deviation which should be reflected in the terms of the Environmental licence issued for the project.

The downstream ecosystem has adjusted to low water levels and flow fluctuations in the past without a spring flood taking place every year. This type of ecosystem is resilient because it is subject to periodic fluctuations and such fluctuations are required to maintain ecosystem relationships. Whether extreme short term conditions result from human regulation or from climatic conditions does not matter to the ecosystem as long as the natural regime is maintained over the long term. This does not mean, however, that low (or high) water conditions caused by human activity are necessarily acceptable if they cause a considerable disruption of existing resources.

Part of the licence request submitted by the Water Resources Branch was that a Pelican Lake Advisory Committee be established to advise on optimum

Conclusions (cont.)

operation of the project (see p. 16). The Clean Environment Commission believes that it is extremely important to the ultimate success of the proposed project operation that an Advisory Committee be established to ensure that any adverse impacts are minimized and that potential benefits are optimized and fairly allocated to the various affected interests by providing recommendations to the Branch on operation of the control structures.

Representation on the Committee should include municipal officials from the R.M.s of Strathcona, Riverside, Turtle Mountain, Argyle and Roblin, local and downstream landowners including farmers and cottage owners. Department of Natural Resources representatives from the Fisheries Branch and the Resource Allocation Working Group and a representative of the Department of Environment should be appointed to the Committee. The Committee should be chaired by a representative from the Water Resources Branch.

Representatives on the Committee should be appointed for five year terms by the Minister of Natural Resources. The Minister of Natural Resources should issue terms of reference to the Advisory Committee in consultation with the Ministers of Environment, Agriculture, and Tourism. The Advisory Committee should meet during the summer before any flow control is exercised and in late winter before spring break-up. Costs of the Committee, which are expected to be minimal, should be borne by the Water Resources Branch.

The Water Resources Branch should monitor water levels on Pelican Lake and downstream to Rock Lake to assess the performance and impacts of the project. Flow forecasting should also be conducted by the Water Resources Branch. Before each meeting of the Advisory Committee the Branch should prepare a report on the past performance of the project, present conditions in affected waterbodies and flow forecasting. The report should be provided to all Committee members and made publically available.

Conclusions (cont.)

The impact of low flows on fish was a concern expressed at the hearing. Northern pike from Rock Lake migrate upstream to spawn in the spring, and have been known to move beyond Lorne Lake during these spawning movements. Successful spawning requires sufficient spring flow so that fish can swim upstream and sufficient summer flow so that newly hatched fry can migrate down to Rock Lake before winter. Mr. Jim Bell said that spring flows must be great enough to puncture beaver dams, otherwise these obstacles will block upstream fish migrations.

Lorne and Louise lakes are not the only spawning habitat available to Rock Lake pike, although it is not known what percentage of Rock Lake pike spawn in these lakes. Mr. Howard said that there have been few studies conducted of the Rock Lake fishery. Lorne and Louise lake spawning runs are not successful every year. The Commission believes that sufficient flows for spawning are desirable, as frequently as possible, to benefit the Rock Lake fishery.

There was considerable discussion at the hearing about the potential for this project to improve Pelican Lake water quality by reducing algae. Based on the available information, the Clean Environment Commission concludes that there is no persuasive evidence that the project will cause significant changes in algae levels or water quality in Pelican Lake. It was reported that past problems with algae have occurred regardless of the elevation of lake water levels. Available water chemistry data suggests that nutrient levels in Pembina River water are similar to Pelican Lake water, so it is not expected that diversion of water will change algae levels in Pelican Lake.

A number of downstream users were concerned that water releases from Pelican Lake could carry algae into downstream lakes, and at levels that would cause problems. This is unlikely to be a problem. The greatest flows from Pelican Lake would be in the spring when floodwaters would be released.

Conclusions (cont.)

Spring is the season when algae levels (Chlorophyll-A) in Pelican Lake are known to be lowest. During the summer and early fall when algae levels are highest, water releases from Pelican Lake may occur but the flows will not be as great.

Algae species floating in Pelican Lake, that might be swept downstream with releases, would likely not survive in a stream environment as such species maintain themselves at an optimal depth in a lake but are otherwise not mobile and have difficulty maintaining themselves against a current. Colonial and single cell algae species from the lake may be broken up and not survive stream currents. Dead algae remains should be absorbed and filtered by the marsh plants along the outlet channel. There should be no measurable change in the amount or species of algae carried into Lorne Lake as compared to earlier years when the diversion project was operated.

At the hearing, Mr. Bill Howard, Regional Fisheries Biologist with the Department of Natural Resources, requested that he visit the site with Mr. Penner to review plans for the outlet channel. Mr. Howard's concern is that fish spawning habitat be maintained. The Clean Environment Commission believes that this consultation is important to ensure optimum design of the outlet channel.

Concern was expressed at the hearing that project structures would be damaged by the maximum floods experienced on the Pembina River. Mr. Penner said that the structures were designed to withstand the maximum recorded floods. The design selected for the weir has been used successfully in many locations in Manitoba. The proposed weir structure has no operating mechanisms, thereby eliminating blockage by debris during overflow periods; however, the 500 mm culvert, located in the base, will have to be routinely maintained to prevent blockage. The Clean Environment Commission is satisfied with Mr. Penner's assurance that the maximum recorded flood would not damage

the project and that the proposed structures are appropriate for the intended purpose.

If dykes and channels to separate Pembina River flows from Pelican Lake outflows, identified as a possible option on the site plan submitted with the proposal, are to be constructed, then the construction should be considered as an alteration to the proposal under Section 14 of the Environment Act. The impact of the dyke and channel on fish spawning habitat and marsh vegetation should be reviewed at that time.

There was much interest and many concerns registered by a variety of individuals and organizations with an interest in the water quality of Pelican Lake and the Pembina River system. The Commission recommends that the rural municipalities adjoining Pelican and Rock lakes should consider joining the Pembina Valley Water Conservation District to facilitate the examination and adoption of measures which would improve water quality of the lakes, the incoming drainage water, and the entire river basin.

RECOMMENDATIONS

The Clean Environment Commission recommends that a licence under the Environment Act be issued to the Water Resources Branch to construct works substantially as shown on the plan entitled "Pelican Lake Enhancement Project, Site Plan Showing Project Components" File No. 14-9-1050A, Revision Date 90-02-27, excluding the dykes and channels identified as possible options. The Clean Environment Commission also recommends the following terms, limits and conditions.

1. The level of Pelican Lake shall be regulated by the Applicant to a target level in the range 411.48 to 411.94 m a.s.l.

2. Up to 9 m^3/s water from the Pembina River may be diverted by the applicant into Pelican Lake. No diversion is to be made when the Pembina River flow at PR 253 above Lorne Lake is less than 0.4 m^3/s.

3. Up to 11 m^3/s water may be released by the Applicant from Pelican Lake to Lorne Lake. No release is to be made when the flow in the Pembina River at PR 253 above Lorne Lake exceeds 20 m^3/s. Pelican Lake releases shall be controlled so that the release flow plus the flow in the Pembina River at PR 253 above Lorne Lake does not exceed 20 m^3/s.

4. The project shall be operated by the Applicant within the specified limits having regard to the resources of Pelican Lake, Lorne Lake, Louise Lake, Rock Lake, the Pembina River and of the areas surrounding the lakes which are affected by the river and lakes.

Recommendations (cont.)

5. A Pelican Lake Advisory Committee shall be appointed by the Minister of Natural Resources in the manner described in this report to advise the Applicant on optimum operation of the project (See pages 53 and 54).

6. The Applicant shall ensure that a report on past performance of the project, present conditions and flow forcasting is prepared and made available to Advisory Committee members and interested members of the public before each meeting of the Committee.

7. The project shall be operated by the Applicant to ensure that:

   a) channel capacities downstream of Pelican Lake shall not be exceeded such that overbank flooding occurs as a result of releases from Pelican Lake, except in the spring when such flooding would normally occur and the project shall be operated when possible to prevent flooding along the Pembina River during seasons other than the spring; and,

   b) periodic spring season flooding downstream of Pelican Lake occurs to the extent and as frequently as deemed optimal by the Advisory Committee to protect the downstream ecosystem.

8. The outlet channel shall be designed by the Applicant in consultation with designated representatives from Fisheries Branch and the Environment Department and constructed to ensure that fish habitat and natural water purification conditions are provided.

Recommendations (cont.)

9. The Applicant shall ensure that all materials excavated from the site during construction, or removed by dredging at a later time, are disposed at a site acceptable to the Environment Department.

10. The Applicant shall undertake a survey of rare and endangered plant species along the Pembina River and the outlet channel between Pelican Lake and Badger Creek and shall undertake any measures deemed necessary by the Environment Department to protect rare and endangered species.

11. The Applicant shall provide fair compensation to any farmers whose agricultural activities between Pelican Lake and Badger Creek are adversely affected by the Pelican Lake Enhancement Project.

L I S T O F E X H I B I T S

Ninette Centennial Hall
10:30 a.m., Thursday, March 8, 1990

1. Hon. J. Glen Cummings, Letter, Requesting the Clean Environment Commission to hold a public hearing with regard to the Pelican Lake Enhancement Project.

2. Jim Bell, brief, with regard to the Water Resources Branch, EIA.

3. Jessie Lowe, brief.

4. Frank Penner, Water Resources Branch, Proposal.

5. Howard Nixon, Councillor, R.M. of Riverside, Verbal Presentation.

6. Greg Sholdra, resident from Winnipeg, Verbal Presentation.

7. Dale Berry, Manhattan Beach, Camp, brief.

8. Rod Stephenson, resident from the Municipality of Strathcona, brief.

9. Dr. Michael Taylor, Pelican Lake Yacht Club, brief.

10. Mrs. Liz Dickson, Killarney resident, brief.

11. Moir Thomson, Killarney resident, brief.

12. Shane Box, resident of Ninette, brief.

13. Wayne Nichol, Reeve, R.M. of Turtle Mountain, brief.

14. John McLelland, Board of the Ninette and District Centennial Hall Inc., brief.

15. Dr. Doreen Moggey, Pelican Lake Development Corp., brief.

16. Edward Crawford, Ninette Community Club, brief.

17. Ward Snyder, Tri-Lake Development Group, brief.

18. Roy McLaren, Tri-Lake Development Group, brief.

19. Jake Harms, Rock Lake Improvement Association, brief.

20. Dr. David Stewart, retired medical doctor, and university teacher, brief.

21. Bob Avery, resident from the R.M. of Argyle, brief.

22. Jack Yellowlees, Verbal Presentation.

23. Mr. & Mrs. Keith Southam, resident, brief.

24. Jim Bell, Pembina Valley Protection Association, brief.

25. John Stillwell, Reeve of the R.M. of Whitewater, brief.

26. Bob Crayston, resident of Rock Lake, Verbal Presentation.

27. Norbert Van Deynze, Lorne Game and Fish Association, brief.

28. Joe Dionne, Tiger Hills Game and Fish, brief.

29. Roy Woolsey, Ninette and Area Lions Club, brief.

30. William N. Howard, Fisheries Biologist, Water Resources Branch, Dept. of Natural Resources, brief.

31. Al Beck, Manitoba Environment, brief.

32. Marcel Timmerman, Treherne Wildlife Association, brief.

33. R. Lundgren, resident of Rock Lake, brief.

34. Vic Neustaedter, Christian Enrichment Family Camp, brief.

L I S T O F E X H I B I T S

Royal Oak Inn, Brandon, Manitoba
8:30 p.m., Thursday, March 8, 1990

1. Helen Riesberry, brief.
2. Dr. Joe Dolecki, University of Brandon, brief.
3. Dr. Gerry McKinney, brief.
4. Gordon Henderson, brief.
5. Eric Geddes, resident from Pilot Mound, brief.
6. Ron Chalmers, Pleasant Valley Cottage Owner's Association, brief.
7. Duncan Stewart, The Sierra Club of Western Canada, brief.
8. Dr. Gordon Goldsborough, scientist at the University of Brandon, brief.
9. Ron McCullough, cottage owner, brief
10. Rod Stephenson, resident from the Municipality of Strathcona, verbal presentation.
11. Alex McWilliams, brief & petition.